
From: Hight, Cate
To: Irving, Bill
Sent: 8/15/2014 12:09:18 PM
Subject: RE: biogenic framework - call this morning?
Attachments: Framework_Report_all comments_7 27_draft final_jm_clean_CH.docx

OK, here's the updated doc with the edits I've made so far.

Will be offline for the next hour or so.

Cate

Cate Hight
U.S. Environmental Protection Agency
Climate Change Division, Climate Policy Branch
202.343.9230
TELEWORK Tuesdays and Thursdays: (b)(6) personal privacy

From: Irving, Bill
Sent: Friday, August 15, 2014 11:13 AM
To: Hight, Cate
Subject: RE: biogenic framework - call this morning?

I have to do a QTA for Sarah on this issue, but will turn to your edits once I'm done. Great that you are making progress.

From: Hight, Cate
Sent: Friday, August 15, 2014 9:43 AM
To: Irving, Bill
Subject: biogenic framework - call this morning?

Hi Bill,

My comments attached on the exec summary. Take a look and give me a call when you're ready (telework # below), so we can discuss whether I'm going in the right direction. Will now continue to the body.

Cate

Cate Hight
U.S. Environmental Protection Agency
Climate Change Division, Climate Policy Branch
202.343.9230
TELEWORK Tuesdays and Thursdays: (b)(6) personal privacy

From: Hight, Cate
To: Irving, Bill
Sent: 8/15/2014 9:43:05 AM
Subject: biogenic framework - call this morning?
Attachments: Framework_Report_all comments_7 27_draft final_jm_clean_CH.docx

Hi Bill,

My comments attached on the exec summary. Take a look and give me a call when you're ready (telework # below), so we can discuss whether I'm going in the right direction. Will now continue to the body.

Cate

Cate Hight
U.S. Environmental Protection Agency
Climate Change Division, Climate Policy Branch
202.343.9230
TELEWORK Tuesdays and Thursdays: (b)(6) personal privacy

From: Kocchi, Suzanne
To: Irving, Bill
Sent: 8/11/2014 1:59:37 PM
Subject: over to you
Attachments: Next Steps on Framework 081114.pptx

I don't need to see your edits beforehand. I think just change whatever text you want and then let's send to Allen.

From: Kocchi, Suzanne
To: Irving, Bill
Sent: 8/11/2014 12:46:56 PM
Subject: slides
Attachments: Next Steps on Framework Janet 081114.pptx

Here is the outline – I could do a bit more text and then you can fill some in when talking to API and then we can send to Allen. Missing anything major?

From: Irving, Bill
To: Suzanne Kocchi
Sent: 7/31/2014 5:56:50 PM
Subject: FW: Left you a voice mail on biomass
Attachments: Biogenic Assessment Framework Update (073114).docx

Still needs work

From: Gunning, Paul
Sent: Thursday, July 31, 2014 4:52 PM
To: Kocchi, Suzanne; Irving, Bill
Subject: Fw: Left you a voice mail on biomass

Bill and Suzie I left you both voicemail. We need to pull together a one pager on the framework and our vision for next steps (SAB and peer review options). Sarah is talking to Janet tomorrow and Janet is going to talk with Gina. I think our one page overview from back in Dec is probably a good start. We will have to conclude with how this could be used and linked to 111d down the road.

Hope this makes sense.

Bill if you could take the lead and get me something by tomorrow AM that would be great

Please call if you have questions

Sent from my BlackBerry 10 smartphone.

From: Dunham, Sarah <Dunham.Sarah@epa.gov>
Sent: Thursday, July 31, 2014 3:38 PM
To: Gunning, Paul
Subject: Left you a voice mail on biomass

Call my cell if you want to talk. I have a one on one with Janet tomorrow pm so would love to have something by then.

From: Kocchi, Suzanne
To: Gunning, Paul; Irving, Bill
Sent: 7/31/2014 6:31:30 PM
Subject: Here is what we came up with for biomass
Attachments: Biogenic Assessment Framework Update (073114).docx

Hope this is what you are looking for and/or doesn't require too much editing. You can call us on our cell phones if you have any questions.

From: Irving, Bill
To: Ohrel, Sara
Sent: 5/16/2014 6:48:34 PM
Subject: RE: team biomass update
Attachments: Framework_Report_5 1_Final (BI).docx

Sara – comments attached. Overall I thought it was much cleaner, clearer and easier to understand. Most of my edits are minor, and are aimed at taking out a modest amount of redundant text, and also

Ex. 5 - Deliberative

Ex. 5 - Deliberative

Bill

From: Ohrel, Sara
Sent: Thursday, May 08, 2014 8:49 AM
To: Irving, Bill
Subject: RE: team biomass update

Thanks Bill, much appreciated. If you could please take a look at Part 2 of the main document, where the framework equation and terms are presented and explained, that would be helpful (as I changed it/added to it quite a bit per comments received).

From: Irving, Bill
Sent: Thursday, May 08, 2014 8:45 AM
To: Ohrel, Sara; Kocchi, Suzanne; Fawcett, Allen
Cc: Cole, Jefferson
Subject: RE: team biomass update

For this question: *CCD review? will any of you and/Paul review?*

Let me know if there are particular sections & appendices that you would like reviewed. I'm out 5/19-24 but can get through some sections next week.

For Paul, I don't expect that he will have time for much reviewing next week given his double-role while Sarah is out. Suzie could confirm.

From: Ohrel, Sara
Sent: Thursday, May 08, 2014 8:43 AM
To: Kocchi, Suzanne; Fawcett, Allen; Irving, Bill
Cc: Cole, Jefferson
Subject: RE: team biomass update

Thanks Suzie.

We did have RTI put something together, and from what I recall it was helpful, but I will have to check on where we stand on that and get back to you (was toward the end of last month when things were a blur).

Actually, if ok with Allen and Jeff, I would like to call in from the train because even if I go in person I have to leave no later than 4:30 which will be disruptive.

From: Kocchi, Suzanne
Sent: Thursday, May 08, 2014 8:40 AM

To: Ohrel, Sara; Fawcett, Allen; Irving, Bill
Cc: Cole, Jefferson
Subject: RE: team biomass update

Looks complete. I don't see the need to have the mtg but if others want it, go for it.

Random question - where do we stand on black liquor? I remember a few weeks ago when you wanted to be sure

Ex. 5 - Deliberative

complete? Where does it stand?

Finally, Sara, Jeff and Allen are going down for the white paper mtg with Goffman correct? I am going to call in.

From: Ohrel, Sara
Sent: Thursday, May 08, 2014 8:35 AM
To: Fawcett, Allen; Irving, Bill; Kocchi, Suzanne
Cc: Cole, Jefferson
Subject: team biomass update

Hello everyone,

Below is an update on what biomass-related items Jeff and I are currently working on (or have questions about, *in italics*):

Framework

Ex. 5 - Deliberative

111d

Ex. 5 - Deliberative

If I missed anything, please feel free to make additions/edits. Also, if anyone feels that we should still have our half hour check in today, please let me know. Otherwise, we can cancel.

Thanks,
Sara

Sara Bushey Ohrel
Climate Economics Branch
Climate Change Division
U.S. Environmental Protection Agency
Phone: (202) 343-9712
Cell: (202) 341-6748

From: Vasu, Amy
To: Stenhouse, Jeb; Stevens, William; Kokopeli, Peter; Adamantiades, Mikhail; Ohrel, Sara; Eschmann, Erich; Conlin, Beth; Sims, Ryan; Lifland, David; Bryson, Joe; Clouse, Matt; Dietsch, Nikolaas; Sherry, Christopher; Deck, Leland; Sarofim, Marcus
CC: McLamb, Marguerite; Wayland, Robertj; Culligan, Kevin; Srivastava, Ravi; Chappell, Linda; Irving, Bill; Birnbaum, Rona; Forte, Reynaldo; Rosenberg, Julie; Hoffman, Howard; Hutson, Nick
Sent: 5/12/2014 5:22:21 PM
Subject: More information -- PRIORITY: Responses to interagency 111(d) preamble comments due to Marguerite McLamb by NOON WEDNESDAY
Attachments: EGU GHG Existing Source Proposal_May 11 2014_051214_5pm.docx

All,

Jeb asked me to pass along the following. David Lifland and I will be incorporating the preamble edits (including line edits from OMB or other responses for the preamble itself that you provide to us), and Marguerite will be compiling the responses to the comment bubbles in a separate document. So that we can meet the 5pm deadline for revision of the preamble, it would be helpful if those revising could send changes to all three of us.

I am attaching the newest version of the preamble. Please use this version to show any changes to the preamble text that you recommend in response to OMB comments (on the 3/28 version).

Thank you.

Amy

From: Stenhouse, Jeb
Sent: Monday, May 12, 2014 2:56 PM
To: Stevens, William; Kokopeli, Peter; Adamantiades, Mikhail; Ohrel, Sara; Eschmann, Erich; Conlin, Beth; Sims, Ryan; Lifland, David; Bryson, Joe; Clouse, Matt; Dietsch, Nikolaas; Sherry, Christopher; Deck, Leland; Sarofim, Marcus
Cc: McLamb, Marguerite; Wayland, Robertj; Culligan, Kevin; Vasu, Amy; Srivastava, Ravi; Chappell, Linda; Irving, Bill; Birnbaum, Rona; Forte, Reynaldo; Rosenberg, Julie
Subject: PRIORITY: Responses to interagency 111(d) preamble comments due to Marguerite McLamb by NOON WEDNESDAY
Importance: High

OAP Folks, please see the attached document, and for interagency comments where I've identified you (in a margin comment) as the responding author, please craft responses in this document (keeping track changes activated), coordinate with your supervisors for review, and then send your markup doc to Marguerite McLamb by the requested deadline of noon on Wednesday. If you do not know how to respond to something assigned to you, or you need a management decision in order to respond, please alert me ASAP.

(P.S. – for folks that have already sent me their responses for this document, I will be getting back to you shortly with my review so you can then get something forward to Marguerite.)

(P.P.S. – there are also interagency comments that were inserted into a redline strikeout of the preamble itself. I will reach back out shortly to identify OAP staff who need to help us craft responses to those comments.)

Jeb

From: Irving, Bill
To: Kocchi, Suzanne
Sent: 4/19/2014 11:13:45 AM
Subject: Fw: Latest version of NCASI white paper on average carbon per acre approach
Attachments: bafReport4RegionsDraft2.pdf

???

From: Gunning, Paul
Sent: Saturday, April 19, 2014 10:14:33 AM
To: Kocchi, Suzanne; Irving, Bill; Fawcett, Allen
Subject: Fw: Latest version of NCASI white paper on average carbon per acre approach

FYI

Sent from my BlackBerry 10 smartphone.

From: Dunham, Sarah <Dunham.Sarah@epa.gov>
Sent: Friday, April 18, 2014 5:20 PM
To: Gunning, Paul
Cc: Krieger, Jackie
Subject: Fw: Latest version of NCASI white paper on average carbon per acre approach

Let's talk monday about the conversation I just had with joe about biomass.

Ex. 5 - Deliberative

Ex. 5 - Deliberative

Sent from my BlackBerry 10 smartphone.

From: Goffman, Joseph
Sent: Friday, April 18, 2014 4:57 PM
To: Dunham, Sarah; Irving, Bill; Ohrel, Sara; Kocchi, Suzanne; Wood, Anna; Santiago, Juan
Subject: Fw: Latest version of NCASI white paper on average carbon per acre approach

From: Dave Tenny <dtenny@nafoalliance.org>
Sent: Friday, April 18, 2014 9:46:10 AM
To: Goffman, Joseph
Cc: Chip Murray
Subject: Latest version of NCASI white paper on average carbon per acre approach

Hi, Joe – here is the last draft of the work NCASI did that Al Lucier presented to you. I believe you all received an earlier version of this. The attached draft is the last version we had prior to Al's untimely passing.

We are working to get a final version of this. Pending that, this document is near final and will hopefully be a good reference for your team. I look forward to talking with you later today.

Dave

David P. Tenny
President and CEO
National Alliance of Forest Owners
122 C Street, NW, Suite 630
Washington, D.C. 20001
Office: (202) 747-0739
Fax: (202) 824-0770

Cell: (703) 964-7519
dtenny@nafoalliance.org
www.nafoalliance.org

An Approach to Using FIA Data in Calculations of Biogenic Accounting Factors for 4 US Regions

*National Council for Air and Stream Improvement **

April 1, 2014

Background

EPA plans to release a new version of its accounting framework for biogenic CO₂ emissions from stationary sources during the first half of 2014. It is expected that the new framework will include a procedure for calculating Biogenic Accounting Factors (BAFs) that is based, in part, on forest conditions in regions of the United States.

In EPA's 2011 draft accounting framework, BAF is defined as: "The fraction of Potential Gross Emissions that becomes a net biogenic CO₂ emission to the atmosphere from using a biologically based feedstock, taking into consideration growth and emission avoidance, carbon stored in products, and site sequestration effects." Important aspects of BAF calculation procedures in the draft 2011 framework included (i) consideration of forest conditions in regions from which stationary sources of biogenic CO₂ obtain biomass feedstock; and (ii) designation of CO₂ emissions from some kinds of feedstock as "anyway emissions" that make zero contribution to net biogenic emissions.

This document describes a simple and practical approach for considering forest conditions in BAF calculations. The central concept is to use data from the public USDA Forest Service Forest Inventory and Analysis Program (FIA)¹ to calculate estimates of above-ground forest biomass (AGB) for a baseline period and for an assessment period for each of several regions in the United States. If the assessment period AGB is not

*<http://www.ncasi.org/>

¹FIA database downloaded on March 1, 2014

significantly less than the baseline period AGB, then $BAF=0$ for that region. If the assessment period AGB is significantly less than baseline period AGB, further analysis could be undertaken to determine whether an increasing rate of timber harvest for bioenergy accounts for the difference in AGB between the baseline and assessment periods.

Methods

We are suggesting FIA data be used to compute estimates of AGB, because it is publicly available and relatively consistent for the lower 48 states. In the example below, we produce estimates of AGB in 4 analysis regions (Fig 1).

- North: CT, DE, IL, IN, IA, KS, MA, ME, MD, MI, MN, MO, NE, NH, NJ, NY, ND, OH, PA, RI, SD, VT, WV, WI
- South: AL, AR, FL, GA, KY, LA, NC, OK, SC, MS, TN, TX, VA
- SouthWest: AZ, CO, NV, NM, UT
- PacifCoastNW: CA, OR, WA, ID, MT

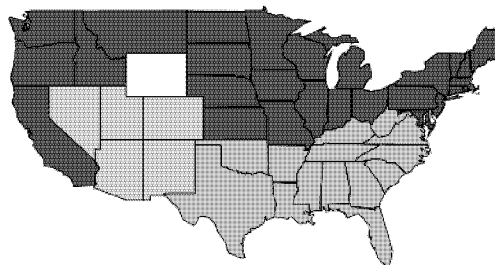


Figure 1: Analysis regions

FIA does not yet have sufficient annual inventory data for WY for that state to be included in the analysis. FIA data for AK is generally limited to coastal areas and was not included. We have not yet considered HI.

For this analysis, we are interested in estimates of AGB (tons) per acre on four classes of forestland defined by owner group and potential for timber production: private timberland; private non-timberland; public timberland; and public non-timberland. The private owner group includes all private owners (individuals, families, corporations, etc). The public owner group includes units of government at all levels (local, county, state, tribal, and federal). Timberland (TL) is defined by FIA as forestland that is not administratively reserved and can grow at least 20 ft^3 per acre annually. Non-timberland (NTL) is forestland that does not meet the definition of timberland because it is reserved from timber production and/or has low productivity.

Annual estimates of mean per acre AGB for each region were computed for the four classes of forestland by averaging plot-level estimates of AGB by plot measurement year as shown in the Appendix. The AGB per acre means for public and private timberland by region are displayed in Fig (2) with the baseline and assessment periods being clearly delineated.

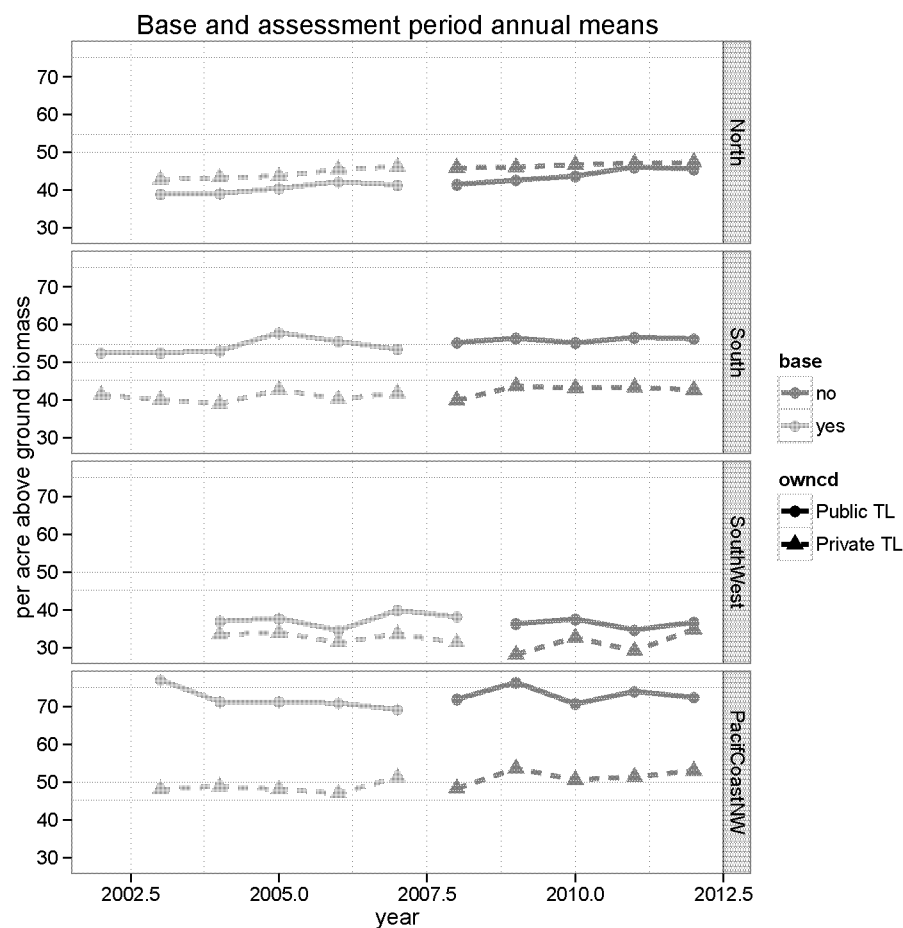


Figure 2: Per acre above ground biomass trends by region for public and private timberland. The baseline period (yes) and the assessment period (no) are indicated for each region.

Years were excluded where less than 75% of the states in the region had measurements. Figure (2) shows trends for public and private timberland by region. Figure (2) makes several points:

1. Trends in AGB are generally flat with slight increases or decreases over time, but overall trends are positive (increasing) except in the SouthWest.
2. Per acre AGB is higher on public land than private land, except in the North
3. Per acre means vary by region and owner

Several considerations justify using timberland AGB per acre values when analyzing forest conditions in support of BAF calculations: (i) Estimates of change in forest area are

much more uncertain than estimates of change in AGB per acre; (ii) Losses of forest area are typically due to development or agricultural expansion, not changes in forest harvest rates; and (iii) Changes in harvest rate are more likely to affect AGB on timberland than on non-timberland that is reserved or unproductive.

Viewing trends in per acre AGB (Fig 2) is useful, but it does not provide a simple BAF statistic. We split the span of years where sufficient data are available into 2 periods for each region, i.e. a baseline period followed by an assessment period. Our approach was to assign an equal number of years to each period with the baseline period getting the extra year when the total number of years is odd. We used a one-sided two-sample t-test assuming unequal variances and independent samples to test H_0 : assessment=baseline versus the alternative that the difference in means (assessment-baseline) is less than 0. Large p-values suggest that H_0 cannot be rejected. A small p-value (say <0.025) suggests that the assessment period mean AGB is less than the baseline period AGB when the t-value is negative.

The t-test results (Tab 1) indicate that the baseline and the assessment periods are significantly different for all regions. However, most regions have positive t-values (except in the SouthWest) and show an increase in AGB for the assessment period.

	Region	Owner	Years	Estimates	p-value	t-value	df
1	North	Private TL	2003,2007,2012	44.72,46.62	0	1122.99	44604
2	North	Public TL	2003,2007,2012	40.8,44.01	0	767.43	19099
3	South	Private TL	2002,2007,2012	40.71,42.69	0	1289.3	53060
4	South	Public TL	2002,2007,2012	54.51,56.15	0	138.94	7814
5	SouthWest	Private TL	2004,2008,2012	32.57,31.04	0	-14.81	625
6	SouthWest	Public TL	2004,2008,2012	37.6,36.36	0	-38.83	2215
7	PacifCoastNW	Private TL	2003,2007,2012	48.79,51.37	0	84.35	4414
8	PacifCoastNW	Public TL	2003,2007,2012	70.7,73.15	0	165.26	13043

Table 1: One-sided two-sample t-test assuming independent samples with unequal variances. Satterthwaite's approximation is used to compute degrees of freedom (df). Results are shown for timberland (TL) by region and owner. The Years column gives the beginning and end of the baseline period and the end of the assessment period. The estimates are the baseline and assessment period means. The p value is based on the computed t-value and df. The magnitude of the t-value indicates the effect size.

Discussion

The selected regions for this analysis could be altered. The North and South regions correspond closely to FIA regions. The PacificCoastNW region includes Idaho and Montana because both states have significant industrial forestry taking place. This makes

ID and MT fit better with CA, OR and WA than with the SouthWest states. The only region that shows some AGB decline is the SouthWest, which is likely due to drought, insects and diseases, and fire. It is unlikely that the SouthWest AGB decline is due to over-harvesting.

This analysis focused on per acre above ground biomass, because AGB is what FIA field plots estimate with the most precision. Soil carbon was not included in this analysis, because it is estimated from limited data and models. Also, the limited nature of the soil carbon data does not allow for realistic estimates of short term trends. Finally, the results produced here can be converted to carbon by dividing AGB by 2.

Appendix

Tables (2) - (5) show per acre above ground biomass, with sample size in parentheses based on FIA plots from the designated inventory year for public and private timberland and non-timberland for each region.

	Private NTL	Private TL	Public NTL	Public TL	All
2003	25.82 (54)	42.72 (5226)	48.49 (306)	38.97 (2267)	41.75 (7853)
2004	16.53 (53)	43.26 (5038)	46.87 (252)	39.07 (2160)	41.99 (7503)
2005	22.03 (58)	43.69 (5065)	44.04 (227)	40.46 (2270)	42.58 (7620)
2006	18.16 (54)	45.47 (5654)	51.69 (285)	42.2 (2316)	44.59 (8309)
2007	15.39 (77)	46.18 (5737)	48.68 (326)	41.33 (2368)	44.65 (8507)
2008	19.03 (51)	45.92 (4690)	53.85 (260)	41.51 (1840)	44.83 (6841)
2009	19.61 (57)	46.05 (4849)	52.48 (263)	42.6 (1878)	45.16 (7047)
2010	21.04 (43)	46.67 (4738)	51.97 (237)	43.7 (2089)	45.82 (7108)
2011	20.26 (52)	47.09 (4704)	56.86 (284)	46.14 (2141)	47 (7181)
2012	22.87 (66)	47.36 (4747)	51.87 (316)	45.54 (2200)	46.79 (7329)

Table 2: Per-acre above-ground biomass and sample size based on annual means for the North region

	Private NTL	Private TL	Public NTL	Public TL	All
2002	12.97 (13)	41.34 (7527)	62.06 (155)	52.53 (1210)	43.18 (8905)
2003	9.49 (13)	40.06 (5129)	52.12 (104)	52.54 (743)	41.75 (5989)
2004	6.97 (656)	38.99 (4623)	38.94 (98)	53 (664)	37.05 (6041)
2005	7.68 (590)	42.7 (4894)	42.85 (100)	57.83 (650)	40.96 (6233)
2006	7.14 (581)	40.25 (7538)	36.56 (125)	55.56 (1038)	39.84 (9282)
2007	7.92 (564)	41.82 (4609)	43.68 (158)	53.44 (728)	40.11 (6059)
2008	8.53 (692)	39.9 (4409)	40.17 (111)	55.27 (621)	37.82 (5833)
2009	7.01 (692)	43.64 (5679)	42.32 (187)	56.36 (901)	41.75 (7459)
2010	8.6 (733)	43.17 (5394)	43.2 (141)	55.17 (835)	41.02 (7103)
2011	6.85 (818)	43.33 (5538)	40.46 (170)	56.58 (854)	40.76 (7380)
2012	12.14 (108)	42.66 (4954)	47.63 (123)	56.24 (758)	43.94 (5942)

Table 3: Per-acre above-ground biomass and sample size based on annual means for the South region

	Private NTL	Private TL	Public NTL	Public TL	All
2004	10.3 (186)	33.47 (54)	13.05 (650)	36.98 (245)	18.74 (1135)
2005	9.07 (308)	33.97 (87)	12.34 (870)	37.78 (279)	17.51 (1544)
2006	10.15 (326)	31.31 (82)	13.43 (835)	34.53 (274)	17.5 (1517)
2007	10.15 (326)	33.58 (84)	12.39 (815)	39.88 (273)	18.09 (1497)
2008	8.78 (316)	31.29 (81)	12.48 (792)	38.18 (280)	17.63 (1468)
2009	10.04 (329)	28.14 (74)	11.96 (831)	36.32 (269)	16.7 (1503)
2010	9.52 (345)	32.63 (71)	11.91 (838)	37.54 (286)	17.09 (1540)
2011	9.96 (303)	29.12 (77)	12.13 (839)	34.71 (267)	16.63 (1485)
2012	9.17 (290)	34.77 (57)	12.22 (828)	36.68 (269)	17.05 (1444)

Table 4: Per-acre above-ground biomass and sample size based on annual means for the SouthWest region

	Private NTL	Private TL	Public NTL	Public TL	All
2003	19.94 (118)	48.08 (479)	55.62 (433)	77.11 (1312)	64.31 (2343)
2004	18.3 (113)	48.84 (553)	52.73 (503)	71.26 (1556)	61.09 (2725)
2005	25.55 (117)	48.09 (521)	52.63 (527)	71.34 (1600)	61.46 (2765)
2006	26.57 (115)	46.98 (539)	52.92 (508)	70.94 (1526)	60.84 (2688)
2007	23.08 (124)	51.24 (535)	49.58 (553)	69.26 (1591)	59.9 (2803)
2008	23.08 (119)	48.35 (522)	51.44 (520)	71.98 (1479)	61.06 (2640)
2009	23.7 (106)	53.6 (510)	50.79 (504)	76.46 (1568)	65.24 (2687)
2010	22.81 (116)	50.58 (535)	55.53 (478)	70.74 (1538)	61.89 (2667)
2011	23.29 (105)	51.37 (544)	55.61 (469)	74.06 (1489)	63.96 (2607)
2012	19.38 (104)	53 (541)	57.85 (433)	72.44 (1584)	64.05 (2661)

Table 5: Per-acre above-ground biomass and sample size based on annual means for the PacifCoastNW region

From: Ohrel, Sara
To: Weitz, Melissa
CC: Irving, Bill; Cole, Jefferson
Sent: 4/14/2014 5:11:00 PM
Subject: RE: Review of various biogenic CO2 framework documents
Attachments: DRAFT Framework main report 2 25 14_F.docx

Thanks for the chat today, and for taking a look at the appendices. As promised, attached is the main draft document for your reference (Exec Summary starts on page ii and baseline discussion on page 22). Once you send your comments (end of this week), we can discuss any questions or comments you may have whenever you have a moment next week. Thanks again and good luck with the inventory release!

Sara

From: Ohrel, Sara
Sent: Wednesday, April 02, 2014 5:14 PM
To: Weitz, Melissa
Cc: Bill Irving; Cole, Jefferson
Subject: Review of various biogenic CO2 framework documents

Hi Melissa,

Bill has informed us that you will be reviewing some components of the biogenic CO2 framework. Attached you will find the draft future anticipated baseline background appendix as well as the baseline construction appendix. If you could please send us your comments by Monday 4/14, that would be greatly appreciated.

Please let us know if you have any questions.

Thank you for your time and help!

Sara

Sara Bushey Ohrel
Climate Economics Branch
Climate Change Division
U.S. Environmental Protection Agency
Phone: (202) 343-9712
Cell: (202) 341-6748

--this email is deliberative--do not distribute or cite--

From: Ohrel, Sara
To: Irving, Bill
Sent: 4/14/2014 9:53:12 AM
Subject: Fw: Biogenic CO2 Next Steps 4 14 14.docx
Attachments: Biogenic CO2 Next Steps 4 14 14.docx

Sent from my BlackBerry 10 smartphone.

From: Kornylak, Vera S.
Sent: Monday, April 14, 2014 9:39 AM
To: Ohrel, Sara; Kocchi, Suzanne; Fawcett, Allen; Cole, Jefferson; Doster, Brian; Jordan, Scott
Subject: Biogenic CO2 Next Steps 4 14 14.docx

Hi Everyone – here's the cleaned up version of this document. We accepted all of OAP's edits on the "Joe" piece and then tweaked a little bit but mostly accepted OAP's edits on the last two pages which described the regulatory applications. My understanding is that the office director/division director folks are opening up the meeting using talking points from this document.

See you soon!

-Vera

From: William N. Irving
To: Irving, Bill
Sent: 4/12/2014 1:26:28 AM
Subject: Re: Biomass Next Steps Document - Latest Version
Attachments: BiomassProposedNextSteps_04112014_so-aaf-bi.docx

All- my edits to the document are attached. I simplified some of the text and deleted most of the comments. I suspect that OAQPS may react negatively to our extensive changes but we do need to reflect our work accurately. It's not a particularly effective briefing document.

In our cover note I suggest that we flag that the sequencing of the roll-out of the Framework, review, cover note, and rule-making notification is really important and we need to discuss it further. For example,

Ex. 5 - Deliberative

Ex. 5 - Deliberative

Ex. 5 - Deliberative

Process going forward - have we been given any indication of the deadline for our comments? Given that the meeting with Joe is Monday morning, they need them before OOB Monday at the latest. If I don't see any further comments from the team before Sunday afternoon, then I will plan to send them to OAQPS at that point along with the general notes that I've flagged. Let me know if this works for you.

Bill

On Friday, April 11, 2014 10:28 PM, "Irving, Bill" <Irving.Bill@epa.gov> wrote:

From: Montanez, Jessica
Sent: Friday, April 11, 2014 3:08:25 PM
To: Ohrel, Sara; Kocchi, Suzanne; Irving, Bill; Fawcett, Allen; Cole, Jefferson; Gunning, Paul
Cc: Mangino, Joseph; Brooks, MichaelS; Wheeler, Carrie; Kornylak, Vera S.; Santiago, Juan; Koerber, Mike; South, Peter
Subject: Biomass Next Steps Document - Latest Version

Paul and Allen,

The latest version of the Biomass Next Steps document is attached and it now includes a two-page description of the
Ex. 5 - Deliberative This document is in preparation for the Biogenic CO₂ next steps meeting with Joe Goffman on Monday. Your comments on this latest version are really appreciated.

Thanks and let us know if you have any questions,

Jessica

Jessica Montañez
Office of Air Quality Planning and Standards
Air Quality Policy Division

New Source Review Group

109 TW Alexander Drive MD: C504-03 RTP, NC 27711

Phone: 919-541-3407, Fax: 919-541-5509

Note: Positions or views expressed here do not represent official EPA policy.

Looking for a speaker for your school or community event? <http://www.epa.gov/rtpspeakings/>

From: Hight, Cate
To: Ohrel, Sara
CC: Irving, Bill; Cole, Jefferson
Sent: 4/10/2014 3:03:23 PM
Subject: RE: Review of various biogenic CO2 framework documents
Attachments: DRAFT App G_Ref Pt Case Studies_3 12 14_vF -CH.docx; DRAFT Framework main report 2 25 14_F_CH.docx

Hi Sarah,

Thanks for the opportunity to review this. A few comments on each doc.

Cate

Cate Hight
U.S. Environmental Protection Agency
Climate Change Division, Climate Policy Branch
202.343.9230
TELEWORK Tuesdays and Thursdays: (b)(6) personal privacy

From: Ohrel, Sara
Sent: Wednesday, April 02, 2014 5:05 PM
To: Hight, Cate
Cc: Irving, Bill; Cole, Jefferson
Subject: Review of various biogenic CO2 framework documents

Hi Cate,

Bill has informed us that you will be reviewing some components of the biogenic CO2 framework. Attached you will find the revised main document (we are currently updating this per other EPA comments, but will fold in your comments) and Appendix G Appendix J on Reference Point Case Studies (you may need the other appendix on reference case methods to understand this one, so let me know once you get into it if you would like that accompanying piece as well). If you could please send us your comments on the main document by next Thursday 4/10 and the reference point case studies by Monday 4/14, that would be greatly appreciated.

Leakage is still under construction but we hope to send it no later than 4/15.

Please let us know if you have any questions.
Thank you for your time and help!
Sara

Sara Bushey Ohrel
Climate Economics Branch
Climate Change Division
U.S. Environmental Protection Agency
Phone: (202) 343-9712
Cell: (202) 341-6748

--this email is deliberative--do not distribute or cite--

From: Ohrel, Sara
To: Weitz, Melissa
CC: Irving, Bill; Cole, Jefferson
Sent: 4/2/2014 5:14:11 PM
Subject: Review of various biogenic CO2 framework documents
Attachments: DRAFT App L FABA Baseline Construction App I 3 12 2014 vF.docx; DRAFT Appendix H Anticipated Baselines background 3 20 14_Cleaner2.docx

Hi Melissa,

Bill has informed us that you will be reviewing some components of the biogenic CO2 framework. Attached you will find the draft future anticipated baseline background appendix as well as the baseline construction appendix. If you could please send us your comments by Monday 4/14, that would be greatly appreciated.

Please let us know if you have any questions.

Thank you for your time and help!
Sara

Sara Bushey Ohrel
Climate Economics Branch
Climate Change Division
U.S. Environmental Protection Agency
Phone: (202) 343-9712
Cell: (202) 341-6748

--this email is deliberative--do not distribute or cite--

From: Browne, Cynthia
To: Kornylak, Vera S.; Gunning, Paul; Irving, Bill; Ohrel, Sara; Embrey, Patricia
Sent: 3/6/2014 2:02:01 PM
Subject: FW: Read Ahead for Tomorrow
Attachments: Legal Authority Administrative Record Crosswalk White Paper 3 6 14.doc

Sorry, missed out your names when I sent out this morning.

Thanks, Cynthia Browne

From: Browne, Cynthia
Sent: Thursday, March 06, 2014 11:11 AM
To: Wood, Anna; Santiago, Juan; Doster, Brian; Zenick, Elliott; Jordan, Scott; Dunham, Sarah
Cc: Heilig, Johnetta; Murphy, Tina
Subject: FW: Read Ahead for Tomorrow

Hi Everyone,

Please see attached document for the 10:00 am meeting on Friday, 3/7.

Thanks, Cynthia Browne

From: Dave Tenny [<mailto:dtenny@nafoalliance.org>]
Sent: Thursday, March 06, 2014 10:39 AM
To: Goffman, Joseph
Cc: Browne, Cynthia; Karisa Smith; Chip Murray; Dan Sakura
Subject: Read Ahead for Tomorrow

Hi, Joe – attached is a read ahead for our meeting tomorrow. You have already seen the legal portions of the document. The new material (beginning with section IV) is the crosswalk with the administrative record. We look forward to seeing you tomorrow.

Dave

David P. Tenny
President and CEO
National Alliance of Forest Owners
122 C Street, NW, Suite 630
Washington, D.C. 20001
Office: (202) 747-0739
Fax: (202) 824-0770
Cell: (703) 964-7519
dtenny@nafoalliance.org
www.nafoalliance.org

**EPA’S CLEAR LEGAL AUTHORITY AND DISCRETION TO
DIFFERENTIATE BIOGENIC CO₂ EMISSIONS FROM OTHER GHG EMISSIONS
UNDER THE CLEAN AIR ACT.**

Table of Contents

Introduction	1
I. EPA Has Legal Authority to Conclude that the Clean Air Act Does Not Authorize EPA to Regulate Emissions Which Do Not Adversely Affect the Environment.....	2
II. EPA Has Substantial Discretion in Applying the Clean Air Act to Biogenic CO ₂ Emissions and in Implementing PSD and Title V Permitting Programs.....	3
A. Exclusion of <i>De Minimis</i> Emissions	4
B. Exclusion of Individual Constituents from Pollutant Categories	5
C. Distinguishing Among GHGs Based on Global Warming Potential.....	7
D. Applying Sector-Based Emissions Thresholds Under The Tailoring Rule.....	8
III. The D.C. Circuit Decision in <i>CBD v. EPA</i> Does Not Limit EPA’s Discretion to Exclude Biogenic CO ₂ Emissions from PSD and Title V Permitting Requirements.	9
IV. Summary of the Factual Bases for Differentiating Biogenic CO ₂ Emissions from Other GHG Emissions in CAA Permitting.....	10
A. Because they are part of the forest carbon cycle, CO ₂ emissions from the combustion of biomass are offset carbon sequestration during regrowth.....	10
B. Scientific studies have repeatedly shown that biomass combustion for energy results in significant GHG emissions reductions when compared to fossil fuel alternatives.....	13
C. Net CO ₂ emissions from biomass energy must be evaluated over broad spatial and time scales.	17
D. Forest Carbon Stocks are Stable or Increasing Across the United States.	19
E. Increased demand for biomass energy feedstocks will not deplete forest carbon stocks.....	22
F. Increased demand for biomass energy will not result in the harvest of high-grade mature trees for energy.....	25
Conclusion	26

Introduction

The Clean Air Act (“CAA”) and supporting case law provide EPA clear legal authority to distinguish between carbon dioxide (“CO₂”) emissions from biomass combustion (“biogenic CO₂ emissions”) and greenhouse gas (“GHG”) emissions from other sources, and thus exclude biogenic CO₂ emissions from CAA regulatory and permitting regimes or, at a minimum, establish a differential regulatory scheme for biogenic CO₂ emissions. In particular, EPA has significant authority and discretion to not bring such emissions within the CAA framework at the outset because CO₂ emissions from biogenic sources do not increase net atmospheric CO₂ concentrations and, therefore, do not cause or contribute to climate change. Thus, EPA need not reach the question of how to treat such emissions under the Prevention of Significant Deterioration (“PSD”) permitting program, as there is ample authority for not bringing such emissions within the framework of PSD—if not the CAA—in the first instance, given the lack of any adverse affect of such emissions on the climate.¹ However, even if EPA were to include biogenic CO₂ emissions in the PSD permitting program, there are established grounds for treating biogenic CO₂ emissions differently from fossil fuel CO₂ emissions. This paper is intended to summarize a range of legal theories that offer flexibility to EPA to differentiate biogenic CO₂ emissions from other GHG emissions as it seeks to implement its ultimate policy decision regarding the treatment of biogenic CO₂ emissions under the PSD and Title V permitting programs. In addition, it will provide a summary of the scientific evidence supporting differential treatment for biogenic CO₂ emissions.

As described below, EPA historically has excluded certain air emissions from the PSD and other CAA programs—even when pollutants that comprise such emissions are otherwise regulated in some contexts. More recently, in the context of GHG regulations, EPA has relied on a variety of regulatory approaches to distinguish between GHGs, completely excluding some from regulation, while providing differential treatment for others. The case for declining to bring biogenic CO₂ emissions within the PSD program (or at a minimum providing differential treatment for such emissions) is even stronger than this past precedent, given the lack of any net adverse effect on the climate from such emissions. In making such a decision, EPA can also properly consider any net GHG benefits that utilizing biomass for power generation or industrial processes provides vis-à-vis other fuels or feedstocks.

This paper is divided into four sections. Section I explains the legal basis for declining to regulate biogenic CO₂ emissions under the CAA at this time because those emissions do not adversely affect the environment. In the alternative, Section II explains that even if EPA were to conclude that it has the authority to consider the regulation of biogenic CO₂ emissions to some extent, it retains significant authority and discretion to exclude or provide different treatment for such emissions. The section provides several legal bases on which EPA could justify treating biogenic and fossil CO₂ emissions differently. Section III explains that the recent decision in *Center for Biological Diversity*, 722 F.3d 401 (D.C. Cir. 2013) does not foreclose EPA’s discretion to provide different and preferential treatment for biogenic CO₂ emissions on a

¹ This white paper focuses on the PSD permitting program as an example for how EPA has solid legal authority to treat biogenic CO₂ emissions differently from other GHG emissions. However, the rationales, justification, and support provided here apply as well to other regulatory programs for addressing GHG emissions under the CAA, and also provide policy and technical support for making such distinctions in other government programs.

permanent basis. Finally, Section IV provides an expanded summary of the key factual bases for differentiating between biomass emissions and other GHG emissions in CAA permitting as well as a brief description of the scientific literature supporting each point.

I. EPA Has Legal Authority to Conclude that the Clean Air Act Does Not Authorize EPA to Regulate Emissions Which Do Not Adversely Affect the Environment.

A core principle underlying much of EPA's regulatory authority under the CAA is that EPA shall regulate only air pollutants that endanger human health or public welfare. Unlike CO₂ emissions from fossil sources, emissions from the combustion of biomass do not increase net atmospheric levels of CO₂.² Domestic forests constitute the nation's leading carbon sink. EPA itself has recognized the lack of any adverse effect from biogenic CO₂ emissions in other contexts. For example, EPA's Mandatory Reporting of Greenhouse Gases Rule distinguishes biogenic CO₂ from other emissions. *See generally* 75 Fed. Reg. 56,260 (Oct. 30, 2009). Likewise, in the Renewable Fuel Standard 2 rulemaking, EPA explained that "[f]or renewable fuels, tailpipe emissions only include non-CO₂ gases, because the carbon emitted as a result of fuel combustion is offset by the uptake of biogenic carbon during feedstock production." 75 Fed. Reg. 14,669, 14,787 (March 26, 2010). In addition, the Department of Energy and virtually every government agency in the world to take up the issue have similarly recognized the lack of any adverse effect from biogenic CO₂ emissions.³ *See also* NAFO's submission on EPA's Call for Information.

Because biogenic CO₂ emissions have no adverse effect on the climate and in the absence of specific direction from Congress to regulate such emissions under the CAA, EPA could reasonably conclude that it lacks a basis for regulating them in the first instance. In the Endangerment Finding, EPA specifically concluded that the combined emissions of GHGs

² As described more fully in Section IV, and in numerous other contexts, net fluxes of biogenic CO₂ to the atmosphere from the combustion of biomass in the United States are, at a minimum, "carbon neutral" in that any CO₂ emissions associated with the combustion of biomass are offset completely by the significant role domestic forests play in sequestering carbon as the nation's leading carbon sink. Thus, when viewed over appropriate time and spatial scales, the combustion of biomass for energy produces significant GHG emissions reductions in comparison to fossil fuel alternatives. As long as domestic forest carbon stocks are stable or increasing, as they are today, the combustion of forest-based biomass for energy will not increase net atmospheric CO₂ concentrations, regardless of the source. In fact, strong demand for forest products—including biomass for energy—has been shown to increase, rather than decrease, forest carbon stocks through increased investments by forest owners. Thus, even under high-demand scenarios, biomass energy demand can be met without significantly affecting markets for high-value timber products. Further, use of certain biomass feedstocks for energy—including harvest residues, mill residuals, and biomass derived from thinning treatments and timber stand management—offer significant GHG reduction benefits because their combustion typically has a *de minimis* impact on overall atmospheric carbon.

³ DOE, *Technical Guidelines: Voluntary Reporting of Greenhouse Gases (1605(b)) Program* (January 2007) at 77 ("Reporters that operate vehicles using pure biofuels within their entity should not add the carbon dioxide emissions from those fuels to their inventory of mobile source emissions because such emissions are considered biogenic and the recycling of carbon is not credited elsewhere."); IPCC *Guidelines for National Greenhouse Gas Inventories*, Prepared by the National Greenhouse Gas Inventories Programme, Institute for Global Environmental Strategies, Hayama, Kanagawa, Japan: IPCC National Greenhouse Gas Inventories Programme (2006); Commission Regulation (EU) No. 601/2012 on the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council, Article 38.2 (The emission factor of biomass shall be zero.), available at <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:181:0030:0104:EN:PDF>.

from new motor vehicles and new motor vehicle engines cause and contribute to air pollution that endangers public health and welfare. EPA reached this conclusion after noting that fossil fuel GHG emissions associated with these sources represented 23 percent of total U.S. emissions of well-mixed GHGs. 74 Fed. Reg. 66,496, 66,540 (Dec. 15, 2009).⁴ Because they do not increase net atmospheric CO₂ concentrations, *see infra* Section IV, biogenic CO₂ emissions are fundamentally different from GHGs emitted from fossil fuel sources regulated under Section 202(a) of the CAA. Biogenic CO₂ emissions do not contribute to climate change and, therefore, do not cause or contribute to the endangerment of public health or welfare. Thus, EPA could reasonably conclude that biogenic CO₂ emissions should be excluded from the scope of its CAA regulatory authority based on the lack of any adverse effects.⁵

II. EPA Has Substantial Discretion in Applying the Clean Air Act to Biogenic CO₂ Emissions and in Implementing PSD and Title V Permitting Programs.

In its landmark *Massachusetts v. EPA* decision, the Supreme Court recognized from the outset that EPA has significant discretion regarding the scope of climate change regulations. While the Supreme Court held that EPA has the authority to regulate GHG emissions from new motor vehicles based on the Court's finding that GHGs fit within the CAA's definition of "air pollutant," the Court also made clear that EPA's determination as to when and how such regulation should proceed is within the discretion of the Agency. *Massachusetts v. EPA*, 549 U.S. 497, 528-29, 533 (2007). "[A]n agency has broad discretion to choose how best to marshal its limited resources and personnel to carry out its delegated responsibilities." *Id.* at 527 (citing *Chevron U.S.A., Inc. v. Natural Resources Defense Council, Inc.*, 467 U.S. 837, 842-845 (1984)); *see also Am. Coke & Coal Chems. Inst. v. EPA*, 452 F.3d 930, 941-42 (D.C. Cir. 2006) ("The court owes particular deference to EPA when its rulemakings rest upon matters of scientific and statistical judgment within the agency's sphere of special competence and statutory jurisdiction.").⁶

⁴ EPA's assessment of motor vehicle GHG emissions as a share of United States GHG emissions specifically excluded biogenic CO₂ emissions because it was based on the United States Greenhouse Gas Inventory. *See* 74 Fed. Reg. at 66,539 n.41 and 66,540; Inventory of U.S. Greenhouse Gas Emissions and Sinks (April 2009) p. 2-5 Table 2-1 n. b and p. 3-1 (excluding biogenic CO₂ emissions based on principles of carbon neutrality). The 2009 Inventory states at page 3-1: "Carbon dioxide emissions from [combustion of biomass and biomass-based fuels] are not included in national emissions totals because biomass fuels are of biogenic origin. It is assumed that the C released during consumption of biomass is recycled as U.S. forest and crops regenerate, causing no net addition of CO₂ to the atmosphere." *See also EPA's Response to Public Comments, Volume 9: The Endangerment Finding* (EPA-HQ-OAR-2009-0171-11676) at 6 (finding that motor vehicle emissions contribute to endangerment does not address biomass burning).

⁵ As explained in Section IV, *infra*, this conclusion would be based on the fact that biogenic CO₂ emissions are offset by the sequestration of atmospheric CO₂ by domestic forests. If, at some later date, EPA determined that carbon stocks were no longer stable or increasing, it could revisit the conclusion that biogenic CO₂ emissions from forest stocks do not adversely affect the environment and, if necessary, apply the legal theories described in Section III, *infra*, to determine how biogenic CO₂ emissions should be addressed under the PSD and Title V permitting programs.

⁶ Courts specifically have affirmed EPA's discretion regarding the timing and approach to the regulation of GHGs following the Court's decision in *Massachusetts v. EPA*. In rejecting a petition to compel the regulation of GHGs after the *Massachusetts* decision, Judge Tatel observed that "nothing in section 202, the Supreme Court's decision in

In the Tailoring Rule and related regulations, EPA surgically exercised such discretion to limit the scope and reach of GHG regulation under the CAA. First, EPA specifically defined the precise “greenhouse gases” that are “subject to regulation” as set forth in that rulemaking. *See* 75 Fed. Reg. at 31,606. EPA limited its definition of “greenhouse gases” to “the aggregate group of six” chemicals and excluded other chemicals that may also have climate impacts. *Id.* Second, EPA invoked a series of administrative law doctrines to increase the emissions thresholds for GHGs far beyond those of conventional pollutants regulated under the PSD program. *See, e.g., id.* at 31,533 (asserting authority “to depart[] from a literal interpretation of statutory provisions”). As a result of these regulatory thresholds, a significant number of sources are excluded from the PSD and Title V permitting programs. EPA’s discretion is further supported by its past practice in other contexts. For example, EPA has long differentiated biogenic CO₂ emissions from fossil fuel CO₂ emissions in its Inventory of U.S. Greenhouse Gas Emissions and Sinks. Likewise, EPA has relied on a variety of administrative law doctrines and other procedures to exclude certain emissions and air pollutants from regulation under the CAA or to distinguish between different types of regulated emissions. The remainder of this section outlines the legal theories and doctrines that EPA could rely upon to exclude biogenic CO₂ emissions from the PSD and Title V permitting programs or, at a minimum, distinguish between biogenic and fossil fuel CO₂ emissions in a manner that recognizes the substantial climate benefits of biomass combustion when compared to fossil fuel alternatives.

A. Exclusion of *De Minimis* Emissions

When establishing PSD regulations, EPA has routinely exercised its discretion to avoid bringing certain air pollutants within the reach of the PSD program. In *Alabama Power Co. v. Costle*, 636 F.2d 323, 400 (D.C. Cir. 1979), the D.C. Circuit recognized EPA’s discretion, in administering the CAA’s provision requiring PSD review for any “modification” of a major emitting facility, “to exempt from PSD review some emission increases on grounds of *de minimis* or administrative necessity.” The Court explained that such an exemption was justified when regulation would “yield a gain of trivial or no value.” *Id.* at 361.

Invoking similar grounds, EPA has limited PSD permitting to those pollutants that are “subject to regulation” under the CAA, although the statute applies the PSD permitting requirements to “any pollutant.” *See Coalition for Responsible Regulation, Inc. v. EPA*, 684 F.3d 102, 134-35 (D.C. Cir. 2012) (*per curiam*) (finding that the CAA does not require EPA to regulate an air pollutant that EPA has determined to be harmless); *see also Alabama Power*, 636 F.2d at 352 n.57. Likewise, even though the CAA may be read to require PSD permitting for any change to a major source that increases emissions of any air pollutant by any amount, *see* CAA §§ 111(a)(4), 169(2)(C), EPA has limited the permitting requirements to modifications that

Massachusetts v. EPA, or our remand order imposes a specific deadline by which EPA must determine whether a particular air pollutant poses a threat to public health or welfare.” *Commonwealth of Massachusetts v. EPA*, No. 03-1361, separate statement of Tatel, J. concurring in part and dissenting in part from denial of petition, June 26, 2008, at 1. Similarly, the Northern District of California also rejected an argument that EPA is compelled to regulate all GHGs following *Massachusetts*. *S.F. Chapter of A. Philip Randolph Inst. v. EPA*, 2008 U.S. Dist. LEXIS 27794 at *10-11 (N.D. Cal. Mar. 28, 2008). Consistent with the D.C. Circuit’s conclusion, the California court recognized that “[t]he Supreme Court was careful not to place a time limit on the EPA, and indeed did not even reach the question whether an endangerment finding had to be made at all.”

result in a “significant” net increase in actual emissions. *See* 40 C.F.R. §§ 52.21(b)(2)(i), 52.21(i); *see also United States v. DTE Energy Co.*, 711 F.3d 643, 645 (6th Cir. 2013).⁷ For example, carbon monoxide emissions increases of up to 99 tons per year are considered insignificant (or *de minimis*) under EPA’s implementing regulations. 40 C.F.R. § 52.21(b)(23)(i); *see also* 45 Fed. Reg. 52,676, 52,705-09 (Aug. 7, 1980) (setting significance levels for PSD permitting programs based on *de minimis* exception). Thus, EPA has a long-standing policy of applying the *de minimis* doctrine to exclude from regulation under the PSD and Title V permitting programs those sources whose emissions increases are deemed insignificant from an air quality perspective, despite the fact that the literal language of the CAA requires permits for *any* emissions increase. *See* 40 C.F.R. § 52.21(b)(23)(i) and (j)(2); 45 Fed. Reg. at 52,722; *Alabama Power*, 636 F.2d at 405.⁸

EPA would be justified in applying a *de minimis* exception for biogenic CO₂ emissions. As explained above, CO₂ emissions from the combustion of biomass are part of the natural carbon cycle and, as a result, do not result in any net increase in atmospheric CO₂ concentrations.⁹ Thus, as long as forest carbon stocks are stable or increasing and carbon sequestration is sufficient to offset biogenic CO₂ emissions, the emissions associated with biomass energy can be considered insignificant or *de minimis* from a climate perspective.

B. Exclusion of Individual Constituents from Pollutant Categories

In cases where EPA defines and regulates a category of pollutants—as it has done for GHGs—the Agency has repeatedly exercised its discretion by distinguishing between individual constituents and excluding those that have negligible environmental impacts. For example, EPA excludes emissions of certain volatile organic compounds (“VOCs”) from otherwise applicable PSD permitting requirements. *See* 40 C.F.R. § 51.100(s); *see also* 40 C.F.R. §§ 52.21(b)(2)(ii) and 52.21(b)(30). Despite the fact that these compounds are both “volatile” and “organic” and, therefore, meet EPA’s definition of VOCs, they are excluded from regulation because they do not cause environmental impacts. *See* 40 C.F.R. § 51.100(d); 57 Fed. Reg. 3,941, 3,943-44 (Feb. 3, 1992) (disagreeing with comment that definition exceeded EPA’s statutory authority and asserting that “it is an administrative necessity and reasonable to define VOC to include all organic compounds except those EPA has determined to be negligibly reactive”). Notably, EPA has excluded these volatile organics from the PSD permitting program and other CAA regulations, not based on an analysis of their direct effects on human health and welfare, but

⁷ Relying on a similar legal theory, EPA has also excluded routine maintenance, repair, and replacement (“RMRR”) from triggering New Source Review program requirements. *See Wisconsin Electric Power Co. v. Reilly*, 893 F.2d 901, 905 (7th Cir. 1990) (EPA adopted exclusion for RMRR to avoid regulating “the most trivial activities”); *see also* 40 C.F.R. parts 51-52.

⁸ In addition, the *Chevron* decision also addressed EPA’s discretion to define the scope of CAA permitting programs, overturning the D.C. Circuit decision that failed to defer to EPA’s interpretation of what constitutes a “stationary source” subject to special permitting conditions in nonattainment areas. *Chevron, U.S.A., Inc. v. NRDC*, 467 U.S. 837, 841-42 (1984).

⁹ Likewise, CO₂ emissions from fermentation of biomass or from microbial treatment of wastewater containing biomaterials are part of the natural carbon cycle and, hence, do not result in a net increase in atmospheric CO₂ concentrations.

rather based on their lack of contribution, once emitted and mixed with other gases in the environment, to the formation of ground-level ozone through photooxidation.

Likewise, EPA has distinguished among different categories of particulate matter (“PM”) based on differences in environmental and public health impacts. *See Alabama Power*, 636 F.2d at 369 n.131 (“EPA has discretion to define the pollutant termed ‘particulate matter’ to exclude particulates of a size or composition determined not to present substantial public health or welfare concerns.”). Thus, EPA has distinguished between fine and coarse PM and established distinct significance levels for particulate matter smaller than 10 microns in diameter and smaller than 2.5 microns in diameter based on the particle size’s impact on public health. 40 C.F.R. § 52.21(b)(23)(i).

In addition, EPA has already relied on this regulatory approach to limit the GHGs that are subject to regulation under the CAA. In the Tailoring Rule and other GHG regulations, EPA exercised its discretion to limit the scope and reach of its GHG regulations by specifically defining the pollutants that qualify as “greenhouse gases.” EPA chose to limit its definition of “greenhouse gases” to “the aggregate group of six” specified chemicals and excluded other chemicals that also have climate impacts. *See* 75 Fed. Reg. 25,324, 25,397 (May 7, 2010) (identifying the six compounds as “the primary greenhouse gases of concern”); *id.* at 25,398-99 (describing those six compounds as a “single air pollutant”). EPA limited the pollutant GHG to these six compounds despite its findings that they only account for 75% of total anthropogenic heating. 74 Fed. Reg. at 66,517, 66,520 (excluding other gases because they are not thought to be a primary driver of radiative heating, or because their climate impact is unknown). Further, after identifying these six compounds as the single pollutant, GHGs, EPA only elected to regulate emissions of four of the six compounds in the light-duty vehicle rule. *Id.* at 25,396-97. Likewise, in the proposed NSPS rule for power plants, EPA asserts that it is regulating the air pollutant GHGs, but is only establishing emissions limits for a single compound, CO₂. 79 Fed. Reg. 1430, 1455 (“The fact that we are not regulating the other five GHGs does not mean that we are required to identify the air pollution as CO₂ alone rather than the mix of six GHGs.”).

This existing precedent under the CAA—and specifically with respect to GHGs—establishes EPA’s regulatory authority to differentiate between certain compounds and exclude some from regulation based on different environmental and public health impacts. As a result, EPA could exercise its discretion to amend its existing regulations to differentiate or exclude from regulation biogenic CO₂ emissions. For example, as it did in the light-duty vehicle rule and the proposed NSPS for power plants, EPA could simply exclude biogenic CO₂ emissions, even though they may technically fall within the broad definition of GHGs. EPA could also redefine its regulatory definition of “greenhouse gases,” to exclude biogenic CO₂ emissions based on the conclusion that biogenic CO₂ emissions do not increase net atmospheric CO₂ concentrations. EPA could also amend its Endangerment Finding to explicitly exclude biogenic CO₂ emissions based on the conclusion that simultaneous carbon sequestration in working forests mitigates any climate impacts associated with biogenic CO₂ emissions¹⁰ In fact, in his concurring opinion in

¹⁰ Alternatively, EPA’s determination that motor vehicle emissions contribute to endangerment of public health and welfare could be interpreted to exclude biogenic CO₂ emissions. The Endangerment Finding was based primarily on the IPCC Fourth Assessment Report of 2007 and EPA’s annual *Inventory of U.S. Greenhouse Gas Emissions and Sinks*, both of which exclude biogenic CO₂ emissions from Energy Sector emissions expressly on the basis of their carbon neutrality. 75 Fed. Reg. at 66,510; 66,537; *see also supra* n.3. Thus, EPA never explicitly considered

CBD v. EPA, discussed *infra*, Judge Kavanaugh suggested that EPA could presumably exclude biogenic CO₂ emissions by ‘tinker[ing] with the Endangerment Finding.’ *CBD*, 722 F.3d at 413 n.1 (Kavanaugh, J. concurring).

C. Distinguishing Among GHGs Based on Global Warming Potential

In the Tailoring Rule, EPA based PSD applicability for GHG emissions on an artificial, calculated emission rate—carbon dioxide equivalents (“CO₂e”)—that takes into account the different global warming potential (“GWP”) of different components of the regulated pollutant “greenhouse gases.” See 40 C.F.R. §§ 52.21(b)(49)(ii)-(v); 75 Fed. Reg. at 31,522. Thus, under current PSD regulations a new source could emit 25 times more CO₂ without obtaining a PSD permit than it could methane. See 40 C.F.R. §§ 52.21(b)(49)(ii) and 40 C.F.R. pt. 98 subpt. A Table A-1. This deviation from a literal application of the statutory PSD provisions is not based on EPA’s GHG regulations for light-duty vehicles, since those rules set separate emission standards for CO₂, methane, and nitrous oxide, and do not involve aggregating emissions of the three compounds or applying weighting factors. See 75 Fed. Reg. at 25,421. Rather, EPA implemented the GWP weighting factors specifically for stationary sources in order to determine whether a new or modified source will require a PSD permit in recognition that emissions of the same annual quantity of different “greenhouse gases” can have very different potential impacts on climate change.¹¹ See 75 Fed. Reg. at 31,531 (using CO₂e, which incorporates global warming potential weighting factors, for determining PSD applicability “best addresses the relevant environmental endpoint”); *id.* at 31,531-32 (rejecting comment that EPA has no discretion to depart from actual annual mass emissions in determining PSD applicability).

EPA could employ similar discretion in the PSD permitting program to distinguish between the global warming potential of biogenic and fossil CO₂ emissions, given that biogenic emissions in the United States do not increase net atmospheric CO₂ and serve to offset the utilization of fossil fuels for combustion.¹² Thus, by applying a GWP of zero to biogenic CO₂ emissions, EPA could effectively exclude biogenic CO₂ emissions from regulation under the PSD permitting program. EPA has discretion to recognize the readily apparent benefits of substituting a carbon neutral fuel for one that releases carbon which may have been stored, and would otherwise remain stored, for millions of years. Such discretion is further supported by past practice; EPA has long differentiated biogenic emissions from fossil fuel emissions in its Inventory of U.S. Greenhouse Gas Emissions and Sinks and in other regulations. See 40 C.F.R.

whether biogenic CO₂ emissions contribute to that endangerment in light of their role in the carbon cycle. As a result, EPA could now reasonably conclude that biogenic CO₂ is not among the air pollutants covered by its endangerment determination.

¹¹ EPA’s use of CO₂e and GWP is consistent with EPA’s practice under the annual *Inventory of U.S. Greenhouse Gas Emissions and Sinks* and with international practice under the Intergovernmental Panel on Climate Change.

¹² EPA has described the “air pollutant” that it is seeking to regulate as the flow of GHGs that changes the total, cumulative stock of greenhouse gases in the atmosphere. 74 Fed. Reg. at 66,536. It would therefore be appropriate for EPA to recognize in the PSD regulations that biogenic CO₂ emissions, which return to the atmosphere CO₂ that was recently removed from the atmosphere in the production of the biomass fuel, and that will be removed again through photosynthesis to replace that biomass, do not add to the total, cumulative stock of GHGs in the atmosphere and therefore represent a net flow of zero.

§ 98.2(b)(2) (excluding biogenic CO₂ emissions from calculation of thresholds for determining which facilities are required to report GHG emissions).¹³ Alternatively, even if EPA concluded that a complete exclusion for biogenic CO₂ emissions was unwarranted, it could apply a smaller GWP to biogenic CO₂ emissions to distinguish between the climate impacts of biogenic and fossil CO₂ emissions in the PSD and Title V permitting programs.¹⁴

D. Applying Sector-Based Emissions Thresholds Under The Tailoring Rule

In the Tailoring Rule, EPA relied on three administrative law doctrines—absurd results, administrative necessity, and one-step-at-a-time—to adjust the PSD and Title V emissions thresholds for GHGs. EPA reasoned that applying PSD and Title V permitting requirements at the relatively low statutory levels intended for criteria pollutants would, in the context of GHGs, place excessive burdens on small sources and on the state and local permitting authorities that implement these permitting programs. *See, e.g.*, 75 Fed. Reg. at 31,517. Instead, EPA adopted a phased-in approach that would begin by regulating the largest emitting sources and potentially adjust the permitting thresholds downward as state and local permitting authorities gained the experience and capacity to process larger quantities of permits. By focusing the phased-in permitting program on the largest sources, EPA explained that it would “direct limited administrative resources to those new sources with the greatest impact on GHG emissions.” *Id.* at 31,529; *see also id.* at 31,531 (addressing “sources and modifications that have the greatest impact on radiative forcing of the GHGs emitted”).

Although EPA did not consider making adjustments in the Tailoring Rule based on the source of the emissions, *id.* at 31,591, it suggested that it would consider source-based adjustments in future rulemakings that would occur under the Tailoring Rule’s phased-in approach. *See, e.g., id.* at 31,516, 31,524, 31,525, 31,590-91. In a future rulemaking under the Tailoring Rule, EPA could justify source-specific regulations for biomass combustion facilities based on the conclusion that biogenic CO₂ emissions are part of the natural carbon cycle and, therefore, are different than fossil fuel emissions. In fact, EPA specifically addressed this possibility in the Tailoring Rule:

[T]he decision not to provide this type of an exclusion [for biogenic emissions] at this time does not foreclose EPA’s ability to either (1) provide this type of an exclusion at a later time when we have additional information about an overwhelming permitting burdens due to biomass sources, or (2) provide another type of exclusion or other treatment based on some other rationale. Although we do not take a final position here, we believe that some commenters’ observations about a different treatment for biomass combustion warrants further exploration as a possible rationale.

¹³ *See also*, NAFO’s submission on EPA’s Call for Information at 3-4; EPA, DRAFT Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2012 (Feb. 21, 2014).

¹⁴ Applying a smaller GWP for biogenic CO₂ emissions from forest stocks may also be warranted if, at some future time, carbon stocks are no longer stable or increasing and EPA seeks to account for the incremental effect of the partial, rather than complete, offsetting of biogenic CO₂ emissions through sequestration.

Id. at 3,1591. In the event that EPA finds that biogenic CO₂ emissions have a negligible (or even positive) effect on atmospheric CO₂ concentrations, a permanent exclusion may be justified under one or more of the administrative law doctrines that EPA relied upon in issuing the Tailoring Rule. Alternatively, even if EPA determines that a full exclusion is not warranted at this time, it could institute even higher emissions thresholds for biogenic CO₂ emissions in recognition that the combustion of biomass for energy reduces GHG emissions when compared to fossil fuel combustion. Based on such a finding, EPA would be justified in concluding that administrative resources could be better spent by focusing on other sectors where emissions have a greater net effect on radiative forcing. EPA could also conclude that applying the same permitting thresholds to biogenic CO₂ emissions as to emissions of CO₂ from fossil fuels would produce absurd results because it would discourage construction of new sources using biomass fuel or modification of existing sources to burn biomass fuel, despite the fact that burning fossil fuel accumulates more CO₂ to the global atmosphere.¹⁵

III. The D.C. Circuit Decision in *CBD v. EPA* Does Not Limit EPA’s Discretion to Exclude Biogenic CO₂ Emissions from PSD and Title V Permitting Requirements.

In July 2011, in response to the National Alliance of Forest Owners’ petition for administrative reconsideration, EPA temporarily deferred the applicability of PSD and Title V permitting requirements to biogenic CO₂ emissions so that the Agency could study the climate impact of biogenic CO₂ emissions and determine how such emissions should be permanently treated under the PSD and Title V permitting programs. 76 Fed. Reg. 43,490 (July 20, 2011). In the so-called “Deferral Rule,” EPA invoked the same administrative law doctrines as it did in the Tailoring Rule. *Id.* at 43,496-99. Center for Biological Diversity and other petitioners sought review of the Deferral Rule.

In *CBD*, the D.C. Circuit issued a decision, split three ways, vacating the Deferral Rule. 722 F.3d 401 (D.C. Cir. 2013). The majority’s holding was based on the conclusion that the Deferral Rule’s invocation of various administrative law doctrines was not adequately supported by the rulemaking record. *Id.* at 410 (EPA “failed to explain” why the one-step-at-a-time doctrine applied); *id.* at 411 (EPA “should have explained why it rejected” a potentially less restrictive alternative under the administrative necessity doctrine); *id.* at 412 (finding EPA’s reliance on the absurd results doctrine to be “post hoc”). Significantly, however, none of the three opinions suggested that EPA lacked authority to permanently exclude biogenic CO₂ emissions from the PSD and Title V permitting programs. Two of the opinions suggested that EPA retained the broad authority described above to permanently exclude biogenic CO₂ emissions, provided the Agency justified its decision in the rulemaking record. *Id.* (“leav[ing] for another day the question whether the agency has authority under the Clean Air Act to permanently exempt biogenic carbon dioxide sources from the PSD permitting program”); *id.* at 420 (Henderson, J. dissenting) (recognizing the “availability of a *de minimis* exception” to

¹⁵ Because fossil fuels typically have higher heat value than biomass fuels, conversion from fossil fuel to biomass usually would result in an increase in the mass of CO₂ emissions, despite the fact that it would reduce the accumulation of CO₂ in the atmosphere. Also, because the equipment to burn biomass fuels often is more costly than for fossil fuels, and the pollution control costs for non-GHG pollutants may be comparable or greater, applying the same permitting requirements to both types of fuels reduces the incentive for sources to choose the biomass fuel route.

permanently exclude biogenic CO₂ emissions from PSD and Title V). Even the concurring opinion, which asserted that EPA's regulatory discretion was limited by the Agency's prior interpretation of its CAA authority, suggested that EPA retained some limited options to permanently exclude biogenic CO₂ emissions. *Id.* at 413 n.1 (Kavanaugh, J., concurring) (suggesting that EPA could exclude biogenic CO₂ emissions by amending its Endangerment Finding). Thus, while the Deferral Rule litigation highlighted the importance of providing a compelling legal and factual basis for excluding biogenic CO₂ emissions from regulation, nothing in the decision suggested that EPA was foreclosed from seeking permanent exclusion at the conclusion of its reconsideration process.

IV. Summary of the Factual Bases for Differentiating Biogenic CO₂ Emissions from Other GHG Emissions in CAA Permitting

While EPA has clear legal authority to exclude biogenic CO₂ emissions from the PSD and Title V permitting programs, there is also an extensive technical and factual record supporting a decision to differentiate biogenic CO₂ emissions from fossil fuel GHG emissions. This Section demonstrates that there is ample scientific support in the existing record before the Agency to support a regulation both excluding biogenic CO₂ emissions from the PSD and Title V permitting programs and supporting a distinction between biomass and other fuels. First and foremost, there is scientific consensus that, because it is part of the natural carbon cycle, biogenic carbon is fundamentally different than fossil carbon. Thus, when forests are managed sustainably, biogenic CO₂ emissions are balanced by carbon sequestered during regrowth. Relying on this scientific premise, studies repeatedly show that combusting biomass for energy offers substantial GHG mitigation benefits when compared to fossil fuel alternatives. Second, there is strong evidence that forests are currently being managed sustainably and will be for the foreseeable future. Thus, when forest carbon stocks are evaluated over appropriate time and spatial scales, there is ample support for the proposition that forests are capable of meeting increased demand without reducing overall forest carbon stocks. This section and annotated bibliography will address in turn the key principles needed to support an exclusion for biogenic CO₂ emissions based on the record that is presently before EPA.¹⁶

- A. Because they are part of the forest carbon cycle, CO₂ emissions from the combustion of biomass are offset carbon sequestration during regrowth.

It is well-established that all wood products—including biomass combusted for energy—are part of the natural forest carbon cycle. CO₂ is sequestered in forests through photosynthesis and emitted through decomposition and combustion. Thus, as long as forests are managed sustainably and forest carbon stocks remain stable (or increase) over time, biomass energy and other parts of the forest products sector do not increase net atmospheric GHG concentrations. In

¹⁶ The articles and studies cited in this section comprise only a portion of the literature that supports differential treatment of biomass emissions. The vast majority of the material presented here has already been submitted to EPA and/or the EPA Science Advisory Board in prior comments and thus is already part of the administrative record. NAFO has included a few more recent articles that provide further support for differential treatment for biomass emissions. Further, virtually all of these articles and studies are either published in peer-reviewed journals or are publicly available and accessible by EPA. NAFO is willing to provide EPA with copies of any materials cited here that are not readily available to the Agency for review.

contrast, CO₂ emissions from fossil fuel combustion permanently increase atmospheric GHG concentrations because they release carbon that has been geologically stored for millennia. Active, sustainable management of forested lands provide a number of distinct climate change mitigation benefits which serve to reduce net GHG emissions over time: (1) durable forest products such as lumber used in construction continue to store carbon for decades after harvest, (2) manufacturing forest products is much less carbon intensive than alternative products such as concrete or steel, and (3) biomass used for energy can directly displace fossil fuel emissions over multiple harvest cycles. These scientific principles have been affirmed by the Science Advisory Board and many other qualified experts:

- Science Advisory Board, *Review of EPA's Accounting Framework for Biogenic CO₂ Emissions from Stationary Sources* at 7, EPA-SAB-12-011 (Sept. 22, 2012) (concluding that “[t]here are circumstances under which biomass is grown, harvested, and combusted in a carbon neutral fashion”).
- Lippke, B., *et al.*, Letter from 113 Scientists to Sen. Boxer and Rep. Waxman (July 20, 2010) (explaining that biomass combustion does not increase net atmospheric CO₂ concentrations because “carbon dioxide released from the combustion or decay of woody biomass is part of the global cycle of biogenic carbon”).
- Martin, R.M., *Deforestation, land-use change and REDD*, *Unasylva* 59(230): 3-11 (2008) (“If the land is encouraged or allowed to regenerate a new forest, the ecosystem effect of harvesting is carbon neutral. . . . The atmospheric effect becomes problematic if the cycle is broken and the land is converted to another use.”).
- Lippke, B., *et al.*, CORRIM, *Life-cycle Environmental Performance of Renewable Building Materials*, *Forest Prod. J.*, 54: 8 (2004) (highlighting climate benefits of using wood products as substitutes for other materials that have larger carbon footprints).
- Miner, R., NCASI, *Biomass Carbon Neutrality* (Apr. 15, 2010), *available at* <http://www.nafoalliance.org/wp-content/uploads/NCASI-Biomass-carbon-neutrality.pdf> (explaining that biomass is carbon neutral due to its role in the carbon cycle and that additional climate benefits occur over each management cycle as additional carbon sequestration occurs through regrowth).
- Lattimore, B. *et al.*, *Environmental Factors in woodfuel production: Opportunities, risks, and criteria and indicators for sustainable practices and utilization*, *Biomass and Energy*, 33: 1321-42 (2009) (explaining that biomass energy from sustainably managed forests is carbon neutral).
- Cherubini, F., *GHG balances of bioenergy systems – Overview of key steps in the production chain and methodological concerns*, *Renewable Energy* 35: 1565-73 (2010) (“When biomass is combusted, the resulting CO₂ is not counted for a GHG because C has a biological origin and combustion of biomass releases almost the same amount of CO₂ as was captured by the plant during its growth.”).

- Gower, S., *Patterns and mechanisms of the forest carbon cycle*, Annual Review of Environment and Resources 28: 169-204 (2003) (“The CO₂ emitted when wood and paper waste is burned is equivalent to the atmospheric CO₂ that was sequestered by the tree during growth and transformed into organic carbon compounds; hence there is no net contribution to the atmospheric CO₂ concentration; and the material is considered C neutral.”).
- Sedjo, R.A., *Biomass: Short-Term Drawbacks, But Long-Term Climate Benefits*, The Energy Daily (Sept. 20, 2010) (concluding that unlike fossil fuel emissions, biogenic CO₂ emissions have no net impact on atmospheric GHG concentrations).
- Bowyer, J., *et al.*, *Life Cycle Impacts of Forest Management and Bioenergy Production* 1-13 (July 2011), available at <http://www.dovetailinc.org/files/DovetailLCABioenergy0711.pdf> (finding that sustainably managed forest are better than carbon neutral when regeneration, displacement of fossil fuels, and long-term carbon storage in durable forest products is considered)
- Sedjo, R., *Carbon Neutrality and Bioenergy: A Zero-Sum Game?*, Resources for the Future Discussion Paper 1-9 (Apr. 2011), available at <http://www.rff.org/documents/RFF-DP-11-15.pdf> (concluding that there are no net CO₂ emissions from biomass energy as long as forest carbon stocks are stable or increasing because CO₂ emissions will be offset entirely by carbon sequestration).
- Lippke, B., *et al.*, *Life cycle impacts of forest management & wood utilization on carbon mitigation: knowns and unknowns*, Carbon Management 2(3): 303-33 (2011) (concluding that combustion of biomass for energy produces no net CO₂ emissions as long as forest carbon stocks are stable or increasing).
- Malmshimer, R.W., *et al.*, *Managing Forests Because Carbon Matters: Integrating Energy, Products, and Land Management Policy*, Journal of Forestry 109(7S) (2011) (concluding that there will be no net CO₂ emissions from biomass energy as long as forest carbon stocks are stable or increasing because emissions will be offset entirely by carbon sequestration).
- Fargione, J., *et al.*, *Land clearing and the biofuel carbon debt*, Science 319: 1235-38 (2008) (“[B]iofuels made from waste biomass or from biomass grown on degraded and abandoned agricultural lands planted with perennials incur little or no carbon debt and can offer immediate and sustained GHG advantages.”).
- Lippke, B. and E. Oneil, CORRIM, *Unintended Consequences of the Proposed EPA Tailoring Rule Treatment of Biomass Emissions the Same as Fossil Fuel Emissions* (2010) (“Life cycle research results accumulated over the last decade . . . demonstrate that the emissions from burning biomass for energy are being offset by the sustained growth in forest carbon.”).

- B. Scientific studies have repeatedly shown that biomass combustion for energy results in significant GHG emissions reductions when compared to fossil fuel alternatives.

Over the past 20 years scientific studies evaluating biomass energy have consistently found significantly lower net GHG emissions when compared to fossil fuel combustion. In particular, a number of recent studies focused directly on the question of carbon neutrality have determined that there are no net CO₂ emissions from woody biomass as long as forests are managed sustainably. Other studies—including a number of life cycle analyses—have attempted to quantify in absolute terms the GHG mitigation benefit of substituting biomass energy for fossil fuels. These studies also identify substantial reductions in GHG emissions, but do not directly answer the question whether biomass combustion for energy results in any net CO₂ emissions. However, these studies consistently conclude that active forest management focused on supplying forests products and biomass energy produces the greatest GHG mitigation benefits from forested lands. While many life cycle analyses show small net GHG emissions from biomass energy, they include certain emissions sources, such as those associated with the harvest and transport of biomass feedstocks, that should be excluded when considering net CO₂ emissions for purposes of PSD and Title V permitting under the Clean Air Act. See Science Advisory Board, *Review of EPA's Accounting Framework for Biogenic CO₂ Emissions from Stationary Sources* at 7, EPA-SAB-12-011 (Sept. 22, 2012) (“While EPA’s primary goal is to account for this offsetting sequestration, its biogenic emission accounting should be consistent with emissions accounting for fossil fuels for other emissions accounting categories—including losses, international leakage, and fossil fuel use during feedstock extraction, production and transport. Including some emissions accounting elements for biomass and not for fossil fuels would be a policy decision without the underling science to support it.”).

- Schlamadinger, B., *et al.*, *Towards a standard methodology for greenhouse gas balances of bioenergy systems in comparison with fossil energy systems*, Biomass and Bioenergy 13(6): 359-75 (1997) (finding that biomass-based fuels produce climate benefits when compared to fossil fuels).
- Abbasi, T. and S. Abbasi, *Biomass energy and the environmental impacts associated with its production and utilization*, Renewable and Sustainable Energy Reviews 14: 919-37 (2010) (finding that biomass-based fuels produce climate benefits when compared to fossil fuels).
- Froese, R.E., *et al.*, *An evaluation of greenhouse gas mitigation options for coal-fired power plants in the U.S. Great Lakes States*, Biomass and Bioenergy 34: 251-62 (2010) (finding that, in the Great Lakes region, co-firing 20% forest residuals in coal-fired power plant reduced GHG emissions by 20%).
- DOE, Ethanol Benefits, *available at* <http://www.afdc.energy.gov/afdc/ethanol/benefits.html> (“Cellulosic ethanol would reduce GHGs by as much as 86%.”).

- EPA, Regulation of Fuels and Fuel Additives: Changes to Renewable Fuel Standard Program, Final Rule, 75 Fed. Reg. 14,670 (Mar. 26, 2010) (finding that cellulosic ethanol reduces lifecycle GHG emissions by more than 60% when compared to conventional fuels).
- EPA, *Renewable Fuel Standard Program, Draft Regulatory Impact Analysis* at 191 (Sept. 2006), EPA420-D-06-008 (finding that cellulosic ethanol reduces lifecycle GHG emissions by 92.7% when compared to conventional fuels).
- Mann, M.K. and P.L. Spath, *A life cycle assessment of biomass cofiring in a coal-fired power plant*, Clean Production Processes 3: 81-91 (2001) (finding that cofiring 15% wood residuals in coal-fired power plant reduced GHG emissions by 18.4%).
- Robinson, A.L., *et al.*, *Assessment of potential carbon dioxide reductions due to biomass – Coal cofiring in the United States*, Environmental Science and Technology 37(22): 5081-89 (2003) (concluding that cofiring forestry and agricultural residuals with coal reduce CO₂ emissions by as much as 95% when compared to fossil fuel combustion).
- Pehnt, M, *Dynamic life cycle assessment (LCA) of renewable energy technologies*, Renewable Energy 31: 55-71 (2006) (finding that combustion of biomass feedstocks such as forest wood, short rotation forestry wood, and waste wood for energy could reduce life cycle GHG emissions by between 85 and 95% when compared to fossil fuels).
- Cherubini, F., *et al.*, *Energy- and greenhouse gas-based LCA of biofuel and bioenergy systems: Key issues, ranges and recommendations*, Resources, Conservation, and Recycling 53: 434-47 (2009) (finding that combustion of forestry residuals for energy reduce life cycle GHG reductions by between 90 and 95%).
- Zhang, Y., *et al.*, *Life cycle emissions and cost of producing electricity from coal, natural gas, and wood pellets in Ontario Canada*, Environmental Science and Technology 44(1): 538-44 (2010) (finding that combustion of wood harvest specifically for energy production reduced lifecycle GHG emissions by 91% relative to coal and by 78% relative to natural gas).
- Raymer, A.K.P., *A comparison of avoided greenhouse gas emissions when using different kinds of wood energy*, Biomass and Bioenergy 30: 605-17 (2006) (concluding that combustion of biomass feedstocks such as fuel wood, sawdust, wood pellets, demolition wood, briquettes, and bark for energy production reduced lifecycle GHG emissions by between 81 and 98%).
- Heller, M.C., *et al.*, *Life cycle energy and environmental benefits of generating electricity from willow biomass*, Renewable Energy 29: 1023-42 (2004) (finding that cofiring 10% willow, a short rotation woody biomass feedstock, with coal reduced GHG emissions by 9.9%).

- Heller, M.C., *et al.*, *Life cycle assessment of a willow bioenergy cropping system*, Biomass and Bioenergy 25: 147-65 (2003) (finding that cofiring 10% willow, a short rotation woody biomass feedstock, with coal reduced GHG emissions by 9.9%).
- Bowyer, J., *et al.*, *Life Cycle Impacts of Forest Management and Bioenergy Production* 1-13 (July 2011), *available at* <http://www.dovetailinc.org/files/DovetailLCABioenergy0711.pdf> (finding that on a life cycle basis, biomass energy reduces GHG emissions by 96% in comparison to coal).
- Gaudreault, C., *et al.*, *Life cycle greenhouse gases and non-renewable energy benefits of kraft black liquor recovery*, Biomass and Bioenergy 46: 683-92 (2012) (finding that combustion of black liquor from Kraft pulping operations for energy reduced lifecycle GHG emissions by 90% relative to coal).
- Hall, D.O., *et al.*, *Alternative roles for biomass in coping with greenhouse gas warming*, Science & Global Security 2: 113-51 (1991) (finding that combustion of woody biomass for energy produces substantial GHG benefits over time when used as a substitute for coal).
- Marland, G. and B. Schlamadinger, *Forests for carbon sequestration or fossil fuel substitution: A sensitivity analysis*, Biomass and Bioenergy 13: 389-97 (1997) (concluding that the use of woody biomass as a substitute for coal in energy production yields substantial GHG emissions reductions over time).
- Schlamadinger, B. and G. Marland, *The role of forest and bioenergy strategies in the global carbon cycle*, Biomass and Bioenergy 13: 275-300 (1996) (concluding that the use of woody biomass as a substitute for coal in energy production yields substantial GHG emissions reductions over time).
- Abt, R.C. *et al.*, Climate Change Policy Partnership, Duke University, *The near-term market and greenhouse gas implications for forest biomass utilization in the Southeastern United States* (2010) (concluding, in a study of forests in the southeastern United States, that the harvest and combustion of biomass for energy “generat[es] net GHG reductions relative to the baseline” when used as a substitute for coal).
- Zanchi, G., *et al.*, *Is woody bioenergy carbon neutral? A comparative assessment of the emissions from consumption of woody bioenergy and fossil fuel*, GCB Bioenergy 4: 761-72 (2012) (finding that combustion of biomass for energy produces long-term reductions in cumulative GHG emissions when compared to combustion of fossil fuels)
- Nabuurs, G.J., *et al.*, *Forestry*, Chapter 9 in Climate change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, (B. Metz, *et al.*, eds.) (2007) (“In the long-term, a sustainable forest management strategy aimed at maintaining or increasing forest carbon stocks, while producing an annual sustained yield of timber, fibre or energy from the forest, will generate the largest sustained mitigation benefit.”)

- Ryan, M.G., *et al.*, *A synthesis of the science on forests and carbon for U.S. forests*, *Issues in Ecology* 13: 1-16 (2010) (“[T]he maximum potential benefit from a project that reestablished forest increases if the stand is periodically harvested and the wood is used for substitution and the biomass used for fuel.”)
- Gaudreault, C. and R. Miner, *Greenhouse Gas and Fossil Fuel Reduction Benefits of Using Biomass Manufacturing Residues for Energy Production in Forest Products Manufacturing Facilities*, Technical Bulletin No. 1016, National Council for Air and Stream Improvement (2013) (finding that combustion of mill residuals for energy reduces lifecycle GHG emissions by 86 to 99% when compared to fossil fuels)
- Electric Power Research Institute, *Biopower Generation: Biomass Issues, Fuels, Technologies, and Opportunities for Research, Development, and Deployment* (Feb. 24, 2010), available at <http://www.epri.com/abstracts/Pages/ProductAbstract.aspx?ProductId=000000000001020784> (“Direct firing of biomass is the only proven carbon-neutral generation technology that is both suitable for baseload operation and available for immediate deployment to support capacity expansion.”).
- Interlaboratory Working Group, Oak Ridge, TN and Berkeley, CA: Oak Ridge National Laboratory and Lawrence Berkeley National Laboratory, *Scenarios of U.S. Carbon Reductions: Potential Impacts of Energy-Efficient and Low-Carbon Technologies by 2010 and Beyond*, ORNL-444 and LBNL-40533 (1997) (concluding that cofiring biomass with fossil fuels was the single largest potential contributor to near-term GHG emissions reduction of any renewable energy strategy).
- Matthews, R. and K. Robertson, EIA Bioenergy Task 38, *Answers to Ten Frequently Asked Questions about Bioenergy, Carbon Sinks and Their Role in Global Climate Change* (2nd ed. 2005), available at www.ieabioenergy-task38.org/publications/faq/ (finding that between 25 and 50 units of bioenergy are produced for every unit of fossil fuel energy consumed in production) (citing Börjesson (1996), Boman and Turnbull (1997), McLaughlin and Walsh (1998), Matthews (2001). and Elsayed *et al.* (2003)).
- Jones, G., *et al.*, *Forest treatment residues for thermal energy compared with disposal by onsite burning: Emissions and energy return*, *Biomass and Bioenergy* 34: 737-46 (2010) (finding that, for forest residues in western Montana, an average of 21 units of bioenergy are produced for every unit of fossil fuel energy consumed in production).
- Walker, T., *et al.*, Manomet Center for Conservation Sciences, *Biomass Sustainability and Carbon Policy Study* (2010) (“All bioenergy technologies, even biomass electric power compared to natural gas electricity, look favorable when biomass waste wood is compared to fossil fuel alternatives.”).
- Heath, L., *et al.*, *Greenhouse gas and carbon profile of the U.S. forest products industry value chain*, *Environmental Science and Technology* 44: 3999-4005 (2010) (explaining that active forest management that produces forest products and biomass energy reduces overall atmospheric GHG concentrations).

- Morris, G., Pacific Institute, *Bioenergy and Greenhouse Gases* (May 15, 2008), available at http://www.pacinst.org/reports/Bioenergy_and_Greenhouse_Gases/Bioenergy_and_Greenhouse_Gases.pdf (finding that the California biomass energy industry produces significant GHG emission reduction benefits by displacing fossil CO₂ emissions from energy production and by avoiding GHG emissions otherwise associated with alternative disposal options for biomass).
- Werner, F., *et al.*, *National and global greenhouse gas dynamics of different forest management and wood use scenarios: A model based assessment*, Environmental Science and Policy 13: 72-85 (2010) (finding that the contributions of the forestry and timber sector to mitigate climate change can be optimized when sustainable harvests are maximized and harvested wood is processed in accordance with the principles of cascade use including the use of “waste wood” residues to generate energy).

C. Net CO₂ emissions from biomass energy must be evaluated over broad spatial and time scales.

Accounting for net CO₂ emissions from biomass energy is scale-dependent, and much of the controversy surrounding biogenic CO₂ emissions has arisen from studies relying on inappropriate spatial and time scales. This is particularly true for forest-based biomass, which is managed on longer rotation cycles. With respect to spatial scales, studies repeatedly demonstrate that a broad, landscape-based approach is necessary to account for the harvest and regrowth that happen simultaneously in different stands over time. Moreover, such an approach is consistent with the spatial scales over which working forests are managed. Likewise, accounting for net CO₂ emissions from biomass requires a long time scale that captures the longer rotation lengths over which forests are managed. A longer time scale is also consistent with climate science because cumulative net emissions, not near-term annual emissions, will determine peak warming.

- O’Laughlin, J., University of Idaho, College of Natural Resources Policy Analysis Group Report No. 31, *Accounting for Greenhouse Gas Emissions from Wood Bioenergy* (Sept. 13, 2010), available at <http://www.uidaho.edu/~media/Files/orgs/CNR/PAG/Reports/PAGReport31> (explaining why a landscape-based approach to carbon accounting is required to reflect that emission and sequestration occur simultaneously, while a stand-based accounting approach misses this point).
- Malmshimer, R.W., *et al.*, *Managing Forests Because Carbon Matters: Integrating Energy, Products, and Land Management Policy*, Journal of Forestry 109(7S) (2011) (explaining that bioenergy offers long-term GHG reduction benefits compared to continued sequestration because forest carbon stocks will eventually reach equilibrium, while bioenergy production continually displaces fossil fuel emissions).

- Lippke, B., *et al.*, *Life cycle impacts of forest management & wood utilization on carbon mitigation: knowns and unknowns*, Carbon Management 2(3): 303-33 (2011) (explaining that bioenergy offers long-term GHG reduction benefits compared to continued sequestration because forest carbon stocks will eventually reach equilibrium, while bioenergy production continually displaces fossil fuel emissions).
- Sedjo, R, *Carbon Neutrality and Bioenergy: A Zero-Sum Game?*, Resources for the Future Discussion Paper 1-9 (Apr. 2011), *available at* <http://www.rff.org/documents/RFF-DP-11-15.pdf> (explaining that a broad, landscape-based spatial scale for carbon accounting is necessary to appropriately reflect the simultaneous regrowth and harvest that take place on individual stands of forested land).
- Strauss, W., *How Manomet got it backwards: Challenging the “debt-then-dividend” axiom* (May 2011), *available at* <http://www.futuremetrics.net/papers/Manomet%20Got%20it%20Backwards.pdf> (explaining that a broad, landscape-based spatial scale for carbon accounting is necessary to appropriately reflect the simultaneous regrowth and harvest that take place on individual stands of forested land).
- Bowyer, J., *et al.*, Dovetail Partners, *Carbon 101: Understanding the Carbon Cycle and the Forest Carbon Debate* (Jan. 2012), *available at* <http://www.dovetailinc.org/files/DovetailCarbon101Jan2012.pdf> (explaining that a broad landscape-based spatial scale demonstrates that overall forest carbon stocks remain stable when harvests take place at different times on different forest stands).
- Lucier, A., National Council for Air and Stream Improvement, Inc., *NCASI Review of Manomet Biomass Study*, (2010), *available at* <http://www.mass.gov/Eoeea/docs/doer/renewables/biomass/study-comments/lucier.pdf> (explaining that stand-based carbon accounting approaches fail to reflect the simultaneous harvest and regrowth that occurs across a sustainably-managed forested landscape).
- Galik, C.S. and R.C. Abt, *The Effect of Assessment Scale and Metric Selection on the Greenhouse Gas Benefits of Woody Biomass*, Biomass & Bioenergy, 44: 1-7 (2012) (concluding that “state, procurement area, and landowner assessment scales most closely approximate the actual GHG emission implications” of biomass energy).
- Meinshausen, M., *et al.*, *Greenhouse-gas emission targets for limiting global warming to 2°C*, Nature 248: 1158-62 (2009) (concluding that a long time frame is appropriate to assess climate impacts of alternative GHG emission scenarios because cumulative net emissions, rather than near-term annual emissions, will determine peak warming).
- Allen, M., *et al.*, *Warming caused by cumulative carbon emissions: Toward the trillionth ton*, Nature 458: 1163-66 (2009) (concluding that a long time frame is appropriate to assess climate impacts of alternative GHG emission scenarios because cumulative net emissions, rather than near-term annual emissions, will determine peak warming).

- Helin, T., *et al.*, *Approaches for inclusion of forest carbon cycle in life cycle assessment – a review*, GCB Bioenergy 5: 475-86 (2013) (concluding that the climate effects of biogenic CO₂ emissions are best characterized by analyzing cumulative radiative forcing over 100-year period).
- Ryan, M.G., *et al.*, *A synthesis of the science on forests and carbon for U.S. forests*, Issues in Ecology 13: 1-16 (2010) (explaining that GHGs are global pollutants with centuries-long effective lifespans and, therefore, must be analyzed over long periods of time and large areas).
- Nechodom, M., U.S. Department of Agriculture, U.S. Forest Service, Pacific Southwest Research Station, *Biomass to Energy: Forest Management for Wildlife Reduction, Energy Production, And Other Benefits*, CEC-500-2009-080 (modeling forest vegetation growth over 40-year period in assessment of biomass energy).
- Miner, R., National Council for Air and Stream Improvement, Inc., *Biomass Carbon Neutrality* (Apr. 15, 2010), available at <http://www.nafoalliance.org/wp-content/uploads/NCASI-Biomass-carbon-neutrality.pdf> (explaining that a landscape-based approach is necessary for carbon accounting because the emissions from harvesting certain forest stands are offset by the sequestration of carbon through new growth in other stands that will be harvested in the future).
- Lippke, B. & E. Oneil, CORRIM, *Unintended Consequences of the Proposed EPA Tailoring Rule Treatment of Biomass Emissions the Same as Fossil Fuel Emissions* (2010), available at <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.189.3736&rep=rep1&type=pdf> (explaining that when forests are managed sustainably, carbon neutrality is observed at the stand level over multiple rotations, and at the landscape level at any given point in time).

D. Forest Carbon Stocks are Stable or Increasing Across the United States.

Stability in forest carbon stocks is an essential prerequisite for establishing that biogenic CO₂ emissions do not increase net atmospheric CO₂ concentrations. If forests are converted to other land uses after harvest, the forest carbon cycle is broken. Thus, while some stand-based changes are inevitable, given urban development and other external pressures, it is essential to ensure that, at a broader landscape level, forest carbon stocks are not depleted as a result of biomass energy. Whether viewed nationally, or on a regional basis, studies consistently find that forest carbon stocks have remained stable—and in many cases increased significantly—over the past 60 years, and this stability has occurred despite significant increases in demand for forest products. Further, projections by the U.S. Forest Service and others suggest that this stability will continue for decades to come.

- Field, C.B., *Primary production for the biosphere: integrating terrestrial and oceanic components*, Science 281: 237-40 (1998) (finding that forests sequester 25-30 billion metric tons of carbon per year).
- Sabine, C.L., *et al.*, *Current status and past trends of the carbon cycle*, in *The global carbon cycle: integrating humans, climate, and the natural world* 17-44 (C.B. Field & M.R. Raupach, eds. 2004) (finding that U.S. forests are a carbon sink).
- Society of American Foresters, *The State of America's Forests* (2007), available at <http://www.safnet.org/publications/americanforests/StateOfAmericasForests.pdf> (noting a 50% increase in forest carbon stocks over second half of the 20th century).
- U.S. Climate Change Science Program and the Subcommittee on Global Change Research, NOAA, *The First State of the Carbon Cycle Report (SOCCR): The North American Carbon Budget and Implications for the Global Carbon Cycle* (King, A.W., *et al.*, eds., 2007) (finding that forests are the largest carbon sink in North America).
- EPA, 2009 US Inventory of Greenhouse Gas Emissions and Sinks: 1990-2007 (stating that U.S. forests capture 10-15% of annual GHG emissions).
- Haynes, R.W., USDA Forest Service, Pacific Northwest Research Station, *The 2005 RPA timber assessment update*, Gen. Tech. Rep. PNW-GTR-699 (2007) (finding that private forests are a net carbon sink and sequester 131 metric tons of CO₂ per year).
- Heath, L.V., *Greenhouse Gas and Carbon Profile of the U.S. Forest Products Industry Value Chain*, Environmental Science and Technology (2010) (projecting that private forests will continue to be a net carbon sink through at least 2040).
- EPA, 2010 US Inventory of Greenhouse Gas Emissions and Sinks: 1990-2008 (“[I]mproved forest management practices, the regeneration of previously cleared lands, and timber harvesting and use have resulted in net uptake (i.e. net sequestration) of [carbon] each year from 1990 through 2008.”).
- Smith, W., *et al.*, U.S. Department of Agriculture, U.S. Forest Service, *Forest Resources of the United States 2007 – General Technical Report WO-78* (2007) (concluding, based on data from 1980 to 2007, that forest carbon stocks are stable or increasing in the Rocky Mountain, Pacific Coast, South, and North regions, and for the U.S. as a whole).
- Walker, T., *et al.*, Manomet Center for Conservation Sciences, *Biomass Sustainability and Carbon Policy Study* (2010) (finding that forest carbon stocks in New England are increasing).
- Heath, L.S., *et al.*, *Managed Forest Carbon Estimates for the U.S. Greenhouse Gas Inventory, 1990-2008*, Journal of Forestry 109(3): 167-73 (2011) (finding that overall forest sequestration is increasing and projecting that forest carbon stocks will remain stable for the foreseeable future).

- Pan, Y, *et al.*, *A Large Persistent Carbon Sink in the World's Forests*, *Science* 333(6054): 988-93 (Aug. 19, 2011) (reporting that United States forest carbon stocks increased by 33% from 1990 to 2007).
- Bowyer, J., *et al.*, Dovetail Partners, *Carbon 101: Understanding the Carbon Cycle and the Forest Carbon Debate* (Jan. 2012), available at <http://www.dovetailinc.org/files/DovetailCarbon101Jan2012.pdf> (noting that between 1950 and 2010 forest carbon stocks increased nationally and across the North, South, Rocky Mountain, and Pacific Northwest regions).
- *More Parkland for Massachusetts*, Northern Woodlands 21 (Summer 2012) (reporting forest carbon stocks in Massachusetts are stable).
- Ince, P.J. and P. Nepal, U.S. Department of Agriculture, U.S. Forest Service, *Effects on U.S. Timber Outlook of Recent Economic Recession, Collapse in Housing, and Wood Energy Trends*, General Technical Report FPL-GTR-219 (Dec. 2012) (projecting that domestic forest carbon stocks will grow through 2060).
- Nepal, P., *et al.*, *Projection of U.S. forest sector carbon sequestration under U.S. and global timber market and wood energy consumption scenarios, 2010-2060*, *Biomass and Bioenergy* 45: 251-64 (2012) (projecting that U.S. forest carbon stocks will increase annually until at least 2045 and will have net growth from current levels until at least 2060).
- Alavalapati, J.R.R., *et al.*, *Forest Biomass-Based Energy, in The Southern Forest Futures Project: technical report*, United States Department of Agriculture (2013) (projecting that increased demand for biomass energy will not reduce forest carbon stocks because increased harvest rates will be offset by increased productivity of fast-growing plantation species).
- Alvarez, M. *The State of America's Forests*, Society of American Foresters (2007) (finding that the amount of forested land in the United States has been essentially constant since 1900).
- Birdsey, *et al.*, *Forest carbon management in the United States: 1600-2100*, *Journal of Environmental Quality* 35: 1461-69 (2006) (finding that U.S. forests and forest products have been a consistent carbon sink since at least the early 1950s).
- The Heinz Center for Science, Economics, and the Environment, *State of the Nations Ecosystem Report* (2008) ("Since 1953, the amount of carbon stored in live trees—the largest carbon pool in forests reported here—has increased by 43%.").
- Lippke, B., *et al.*, Letter from 113 Scientists to Sen. Boxer and Rep. Waxman (July 20, 2010) (explaining that forested acres have been stable for 100 years, while forest carbon stocks have increased by 50%).

- Forisk Consulting, *Woody Biomass as a Forest Product: Wood Supply and Market Implications* (Oct. 2011) (projecting an adequate supply of woody biomass to meet estimated bioenergy demands through 2022).
- Forisk Consulting, *Three Realities of Wood Bioenergy and Forest Owners* (2010), available at <http://backup.forisk.com/UserFiles/File/Three%20Realities%20of%20Wood%20Bioenergy%20and%20Forest%20Owners%20final.pdf> (“Timber per acre in the US has increased nearly one-third since 1952 and US forest growth has exceeded harvest since the 1940s.”).

E. Increased demand for biomass energy feedstocks will not deplete forest carbon stocks.

Despite the stability in forest carbon stocks over time, some have expressed concern that increased demand for biomass energy will reduce the amount of carbon that would otherwise be stored in forests. However, these concerns are inconsistent with the market factors that influence forest management decisions. Studies have repeatedly found that forest owners will respond to increased demand for biomass energy (or any other forest product) by increasing production, and thereby increasing forest carbon stocks. In the case of biomass energy, such responses can take several forms, including (1) increased consumption of existing harvest residuals, (2) increased productivity through investments in forest management practices, and (3) land use changes such as afforestation, reforestation, or avoided deforestation.

- Science Advisory Board, *Review of EPA’s Accounting Framework for Biogenic CO₂ Emissions from Stationary Sources* at 7, EPA-SAB-12-011 (Sept. 22, 2012) (“Some research has shown that when a future demand signal is strong enough, expectations about biomass demand for energy (and thus revenues) can reasonably be expected to produce anticipatory feedstock production changes with associated changes in land management and land use . . .”).
- Nechodom, M., U.S. Department of Agriculture, U.S. Forest Service, Pacific Southwest Research Station, *Biomass to Energy: Forest Management for Wildlife Reduction, Energy Production, And Other Benefits*, CEC-500-2009-080 (Jan. 2010) (finding that the transition from passive to active management can occur without “carbon debt” due to reduced carbon losses from wild fire).
- Zhang, J., *et al.*, U.S. Department of Agriculture, U.S. Forest Service, Pacific Southwest Research Station, *To Manage or Not to Manage: The Role of Silviculture in Sequestering Carbon in the Specter of Climate Change* RMRS-P-61 /(2010) (showing that active forest management increased carbon sequestration and decreased fire-caused mortality).
- Clutter, M., *et al.*, *A Developing Bioenergy Market and its Implications on Forests and Forest Products Markets in the United States* (prepared for NAFO, 2010) available at <http://www.nafoalliance.org/wp-content/uploads/NAFO-Executive-Summary-Clutter-Et-Al-Final.pdf> (concluding that capacity exists to increase forest productivity by as much as 150% in South and Pacific Coast regions in response to increased market demand).

- James, C., *et al.*, *Carbon Sequestration in Californian Forests; Two Case Studies in Managed Watersheds* (2007) available at http://www.spi-ind.com/html/forests_research.cfm (concluding that implementing optimal policy incentives could double the amount of carbon sequestered by forests).
- Wear, D.N. and J.P. Prestemon, *Timber market research, private forests and policy rhetoric*, in *Southern Forest Science: Past, Present, and Future* General Technical Report SRS-75, Southern Research Station, USDA Forest Service, Asheville, NC (H.M. Raucher and K. Johnsen, eds. 2004) (explaining that economic return for forest products creates incentives for private forest stewardship).
- Lubowski, R.N., *et al.*, Economic Research Service, U.S. Department of Agriculture, *Environmental Effects of Agricultural Land-Use Change: The Role of Economics and Policy*, Economics Research Report No. 25, (Aug. 2006) (concluding that in the absence of market incentives, many working forests would be converted to non-forest uses).
- Ince, P.J., *Global Sustainable Timber Supply and Demand*, in *Sustainable Development in the Forest Products Industry*, Chapter 2, 29-41 (2010) (finding positive correlation between markets for forest products, including bioenergy, and annual increases in forest carbon stocks).
- Sedjo, R., *Carbon Neutrality and Bioenergy: A Zero-Sum Game?*, Resources for the Future Discussion Paper 1-9 (Apr. 2011), available at <http://www.rff.org/documents/RFF-DP-11-15.pdf> (explaining that bioenergy contributes to strong markets for forest products and creates incentives for forest owner to invest in forests rather than alternative land uses).
- Innovative Natural Resources Solutions LLC, *Identifying and Implementing Alternatives to Sustain the Wood-Fired Electricity Generating Industry in New Hampshire* (Jan. 2002), available at http://www.inrsllc.com/download/wood_fired_electricity_in_NH.pdf (explaining that biomass energy markets provide incremental value from low-grade forest products and help ensure that forests remain an economically competitive land use option in New Hampshire).
- Kingsley, E., *Importance of Biomass Energy Markets to Forestry: New England's Two Decades of Biomass Energy Experience* (June 2012), available at http://www.usendowment.org/images/Importance_of_Biomass_Energy_Markets_to_Forestry_6.2012.pdf (explaining that biomass energy markets provide incremental value from low-grade forest products and help ensure that forests remain economically competitive with other land uses).
- Maine Forest Service, *Maine Forest Service Assessment of Sustainable Biomass Availability* (July 17, 2008), available at http://www.maine.gov/dacf/mfs/about/state_assessment/downloads/maine_assessment_and_strategy_final.pdf (projecting that forest productivity in Maine could be increased by 88-273% through additional investments in site preparation, planting, competition control, and thinning).

- Sedjo, R. and X. Tian, *Does Wood Bioenergy Increase Carbon Stocks in Forests?*, Journal of Forestry 110: 304-11 (2012) (concluding that when “demand [for biomass] is greater than the sustainable harvest of the forest, prices will rise, total forest area will expand to meet the increasing demand, and in the process, will capture and store more carbon”).
- Sedjo, R. and B. Sohngen, *Wood as a Major Feedstock for Biofuel Production in the United States: Impacts on Forests and International Trade*, Journal of Sustainable Forestry 23: 195-211 (2003) (explaining that strong market signals supporting future demand for forest products will cause forest owners to make anticipatory changes to ensure that the demand will be met).
- Wear, D.N. and J.G. Greis, *The Southern Forest Futures Project: Summary Report* (May 12, 2011), available at http://www.srs.fs.usda.gov/futures/reports/draft/summary_report.pdf (explaining that strong timber markets (1) encourage landowners to retain forests rather than converting them to other land uses and (2) encourage continued investment in forest management).
- MacCleery, D., *American Forests: A History of Resiliency and Recovery* (1996) (concluding that biomass energy can be an important new market that replaces other markets with declining demand and adds economic value to private forest ownership).
- Alavalapati, J.R.R., et al., *Forest Biomass-Based Energy*, in The Southern Forest Futures Project: technical report, United States Department of Agriculture (2013) (projecting that under high biomass energy demand scenarios forest owners will increase productivity and expand the number of forested acres to meet demand).
- Daigneault, A., et al., *Economic approach to assess the forest carbon implications of biomass energy*, Environmental Science and Technology 46: 5664-71 (2012) (explaining that strong markets for biomass keep land forested and encourage the planting of new forests).
- Lubowski, R., et al., *What drives land-use change in the United States? A National Analysis of Landowner Decisions*, Land Economics 84: 529-50 (2008) (explaining that demand for wood produces investments by landowners that prevent forest loss through land use change and encourage afforestation).
- Hardie, I., et al., *Responsiveness of rural and urban land uses to land rent determinations in the U.S. South*, Land Economics 76: 659-73 (2000) (explaining that demand for wood produces investments by landowners that prevent forest loss through land use change and encourage afforestation).
- Abt, R.C. et al., Climate Change Policy Partnership, Duke University, *The near-term market and greenhouse gas implications for forest biomass utilization in the Southeastern United States* (2010) (“Forest harvest and planting decisions are affected by an uptick in demand for biomass, which in turn affects net carbon storage over time.”).

- F. Increased demand for biomass energy will not result in the harvest of high-grade mature trees for energy.

Despite its promise as a renewable energy source that does not increase atmospheric CO₂ concentrations, biomass energy relies on low-cost biomass feedstocks to remain competitive with other types of energy. Thus, biomass energy feedstocks are commonly composed of mill residues, harvest residuals, thinning treatments, and other low-grade feedstocks. In contrast, high-grade trees are reserved for saw timber and other similar products that command higher prices. Given the price differential between low-grade biomass energy feedstocks and saw timber, it is unlikely that high-grade, mature trees would ever be harvested exclusively for biomass energy production. While increased demand for biomass energy could increase prices to some degree, even the most optimistic projections for biomass energy would not raise feedstock prices to the point that landowners would begin managing forests for biomass energy instead of high-value saw timber. Thus, concerns over carbon stock depletion due to the harvest of high-grade, mature trees for biomass energy are misplaced.

- Forisk Consulting, *Woody Biomass as a Forest Product: Wood Supply and Market Implications* (Oct. 2011) (finding that a 435% increase in biomass energy demand by 2016 would be required to make forest management exclusively for biomass energy as profitable as management for saw timber).
- Ince, P.J., *Global Sustainable Timber Supply and Demand*, in *Sustainable Development in the Forest Products Industry*, Chapter 2 29-41 (2010) (explaining that biomass energy feedstocks are among the lowest value forest products).
- Innovative Natural Resources Solutions LLC, *Identifying and Implementing Alternatives to Sustain the Wood-Fired Electricity Generating Industry in New Hampshire* (Jan. 2002), available at http://www.inrsllc.com/download/wood_firedelectricityinNH.pdf (explaining that biomass energy relies on low-cost, low-grade feedstocks, not high-grade feedstocks that command higher prices in the market).
- Kingsley, E., *Importance of Biomass Energy Markets to Forestry: New England's Two Decades of Biomass Energy Experience* (June 2012) (explaining that biomass energy relies on low-cost, low-grade feedstocks, not high-grade feedstocks that command higher prices in the market).
- Maine Forest Service, *Maine Forest Service Assessment of Sustainable Biomass Availability* (July 17, 2008) (concluding that Maine has 9.69 million green tons per year of unutilized biomass available for biomass energy).
- U.S. Department of Energy, *Billion-ton update: biomass supply for a bioenergy and bioproducts industry* (2011) (projecting that a goal of replacing 30% of U.S. fossil fuel consumption with biomass resources can be achieved without using current pulpwood or saw timber supplies).

- MacCleery, D., *American Forests: A History of Resiliency and Recovery* (1996) (explaining that biomass energy can be an important new market that can replace other declining markets and add economic value to private forest ownership).
- Forisk Consulting, *Wood Bioenergy Markets and Forestland Owner Decisions: 2010-2013* (2014) (finding that projected demand for bioenergy feedstocks will not alter current forest management practices that are focused on saw timber production)
- U.S. Department of Agriculture, U.S. Forest Service, *Future of America's Forest and Rangelands: Forest Service 2010 Resources Planning Act Assessment*, Gen. Tech. Rep. WO-87 (2012) (projecting that large, mature trees are unlikely to be used for bioenergy due to price competition from higher value forest products).
- Abt, K.L. *et al.*, *Effect of Bioenergy demands and supply response on markets, carbon, and land use*, *Forest Science* 58: 523-39 (2012) (projecting that price increases associated with biomass energy demand in the southern United States will remain far below prices for saw timber).
- Abt, R.C. and K.L. Abt, *Potential impact of bioenergy demand on the sustainability of the southern forest resource*, *Journal of Sustainable Forestry* 32: 175-94 (2013) (projecting that price increases associated with biomass energy demand in the southern United States will remain far below prices for saw timber).
- Timber Mart-South, Univ. of Georgia, *Southeastern Timber Market News and Price Reports* (2013) (projecting that price increases associated with biomass energy demand in the southern United States will remain far below prices for saw timber).
- Haq, Z., *Biomass for Electricity Generation*, EIA (July 2002), available at <http://www.eia.gov/oiaf/analysispaper/biomass/pdf/biomass.pdf> (projecting that by 2020, agricultural residues, energy crops, forestry residues, and urban wood waste/mill residues will provide as much as 7.1 quadrillion BTUs of biomass at a price of \$5 per BTU or less).

Conclusion

It is clear that EPA has the legal authority, the record support, and the discretion to exclude biogenic CO₂ emissions from the CAA and/or the PSD permitting program or, in the alternative, to differentiate between biogenic CO₂ emissions and other GHG emissions. As EPA reconsiders the treatment of biogenic CO₂ emissions in the Tailoring Rule, it must reconcile the Tailoring Rule with both sound science and policy regarding renewable energy. By regulating CO₂ emissions from biomass combustion identically to fossil fuel GHG emissions, the Tailoring Rule both ignores well-settled principles regarding the balance of biogenic CO₂ emissions and CO₂ sequestration in the United States and removes any regulatory incentive to utilize biomass in place of coal and other fossil fuels.

From: Kocchi, Suzanne
To: Kornylak, Vera S.; Ohrel, Sara; Irving, Bill
Sent: 2/7/2014 3:25:50 PM
Subject: RE: AF&PA for Wed
Attachments: Janet McCabe Event Form.docx; McCabe Meeting Request 021214.pdf

Adding Bill. Thanks.

From: Kornylak, Vera S.
Sent: Friday, February 07, 2014 3:12 PM
To: Ohrel, Sara; Kocchi, Suzanne
Subject: FW: AF&PA for Wed

FYI – looks like we need to put together talking points for Janet and Joe – we'll try to make sure you get a chance to review as well (we'll be pulling from previous documents so shouldn't be anything new at this point).

From: Irving, Bill
To: Kocchi, Suzanne
Sent: 1/6/2014 11:31:57 AM
Subject: FW: Biogenic Carbon Accounting
Attachments: Biogenic Carbon Accounting Paper 112513.pdf; image001.jpg

From: Noe, Paul [mailto:Paul_Noe@afandpa.org]
Sent: Thursday, January 02, 2014 4:16 PM
To: Goffman, Joseph
Cc: Gunning, Paul; Jenkins, Jennifer; Wood, Anna; Santiago, Juan; Ohrel, Sara; Irving, Bill; Dunham, Sarah
Subject: Biogenic Carbon Accounting

Joe et al:

Happy New Year – I hope you had a relaxing break. I wanted to pass along our short paper on Biogenic Carbon Accounting, which includes our basic recommendations.

Best regards,

Paul

Paul Noe
Vice President for Public Policy
Paul_Noe@afandpa.org
(202) 463-2777
AMERICAN FOREST & PAPER ASSOCIATION
1101 K Street, N.W., Suite 700
Washington, D.C. 20005



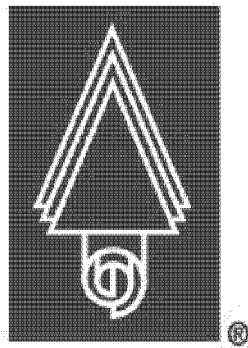
***** ATTACHMENT NOT DELIVERED *****

This Email message contained an attachment named
image001.jpg
which may be a computer program. This attached computer program could
contain a computer virus which could cause harm to EPA's computers,
network, and data. The attachment has been deleted.

This was done to limit the distribution of computer viruses introduced
into the EPA network. EPA is deleting all computer program attachments
sent from the Internet into the agency via Email.

If the message sender is known and the attachment was legitimate, you
should contact the sender and request that they rename the file name
extension and resend the Email with the renamed attachment. After
receiving the revised Email, containing the renamed attachment, you can
rename the file extension to its correct name.

For further information, please contact the EPA Call Center at
(866) 411-4EPA (4372). The TDD number is (866) 489-4900.



American Forest & Paper Association

**Biogenic Carbon Accounting: The Carbon Neutrality of
Energy Produced by the U.S. Forest Products Industry**

November 2013

Paper and wood products manufacturers use biomass from sustainable forestry operations to produce energy, providing significant carbon reducing benefits to the environment. **AF&PA urges EPA to continue to recognize the forest products industry's unique biomass use as carbon neutral.** EPA's pending framework to account for biogenic carbon emissions for Clean Air Act permitting decisions makes this issue current and of great significance to the industry.

Science of the Natural Carbon Cycle

As forests grow, carbon dioxide (CO₂) is removed from the atmosphere via photosynthesis. This CO₂ is converted into organic carbon and stored in woody biomass. Trees release the stored carbon when they die, decay, or are combusted. As biomass carbon is released, the carbon cycle is completed. The carbon in biomass will return to the atmosphere regardless of whether it is burned for energy, allowed to biodegrade, or lost in a forest fire. The net impact is that CO₂ flows in and out of forests and through the forest products industry by both biomass combustion and sequestration in products. Overall, the flow of forest CO₂ is carbon positive when forests are sustainably managed, and the forest system remains a net sink of CO₂ from the atmosphere. Thus, the carbon neutrality of sustainably managed forest biomass is a scientifically supported fact.

The carbon neutrality of biomass harvested from sustainably managed forests has been recognized repeatedly by an abundance of studies, agencies, institutions, legislation and rules around the world, including the guidance of the Intergovernmental Panel on Climate Change and the reporting protocols of the United Nations Framework Convention on Climate Change. As governments continue to implement incentives and mandates to increase the use of renewable fuels, concerns arise over the potential depletion of forest carbon stocks that may upset the carbon balance. Increasing demand must be coupled with increased supply.

Accounting for CO₂ in Biomass Energy

In 2010, EPA announced it would regulate CO₂ emissions under the Clean Air Act's Prevention of Significant Deterioration permit program. In 2011, EPA issued a rule to defer the permitting requirements for biogenic CO₂ for three years (until July 2014) and released a draft Accounting Framework for Biogenic CO₂ Emissions From Stationary Sources (which recognized the greenhouse gas reduction benefits of energy produced from mill residuals). EPA then submitted the draft framework to its Science Advisory Board (SAB) for peer review, which was completed in September 2012. EPA is considering the SAB recommendations and public comments as it works to revise the framework and propose regulations on biogenic emissions. On July 12, 2013, the D.C. Circuit Court of Appeals vacated EPA's Deferral Rule, stating EPA failed to adequately justify the temporary delay, but the court left the door open for EPA to issue permanent regulations distinguishing biogenic CO₂ from other CO₂ emissions. However, the official mandate from the court has been temporarily delayed pending the outcome of another case being considered by the Supreme Court. The ruling underscores the need for EPA to complete its work.

Benefits of the Industry's Responsible and Efficient Biomass Use

The forest products industry is by far the largest producer and user of bioenergy of any industrial sector and has long-standing operations in the U.S. The creation and use of biomass energy in forest products mills is integral and incidental to the manufacture of products such as pulp, paper, packaging, and wood products. Pulp mills, integrated pulp and paper mills, and wood products mills convert biomass residuals to energy while manufacturing biobased products that are useful to society. The forest products industry has created a highly efficient, market-based system of managed forest use with significant carbon benefits including:

- providing biomass power by utilizing forest and mill residuals;
- efficiently using biomass residuals through combined heat and power systems to minimize GHG emissions and extract the most value out of each tonne of carbon emitted.
- reducing the industry's and our nation's reliance on fossil fuels and reducing GHG emissions while simultaneously meeting society's needs for forest products;
- avoiding potential GHG emissions that otherwise would result from disposal of residuals (e.g., methane from decomposition);
- balancing forest supply and demand through market-based systems for biomass due to forest planting and re-growth, as evidenced by net increases in forest carbon stocks over most of the last 50 years;
- robustly recycling paper to reuse valuable biomass resources; and supporting nine times as many total jobs as stand-alone biomass energy production.¹

These environmental, economic and social benefits can be perpetuated sustainably if forests continue to remain abundant and well managed, with forest use and growth balancing supply and demand.

Carbon Neutrality of Biomass Manufacturing Residuals

There are large greenhouse gas reduction benefits from the use of manufacturing residuals for biomass energy in the forest products industry. A recent study, "Greenhouse Gas and Fossil Fuel Reduction Benefits of Using Biomass Manufacturing Residues for Energy Production in Forest Products Facilities,"² examined the life cycle

¹ AF&PA-sponsored research found that, for a given volume of wood consumption, the forest products industry (paper and wood manufacturing) sustains five times as many core jobs (i.e., mill jobs) and nine times as many total jobs (including logging, paper converting jobs, and downstream wood processing jobs) as stand-alone biomass energy facilities (electricity, wood pellets, and cellulosic ethanol). See RISI, "Job Creation in PPI and Energy Alternative in the United States" (June 25, 2010). The RISI results are roughly consistent with a study sponsored by the Confederation of European Paper Industries, which focused on Europe and found that the paper industry supported 6 times as many direct jobs and 13 times as many total jobs as the electric utility sector. See Pöyry, "Value Added and Employment in PPI and Energy Alternative" (2006).

² This report was done by the National Council for Air and Stream Improvement (NCASI), which is an independent, non-profit research institute that focuses on environmental and sustainability topics relevant to forest management and the manufacture of forest products.

greenhouse gas and fossil fuel reduction benefits of using biomass residuals for energy production in the U.S. forest products industry. Wood processing activities at pulp, paper and wood products mills generate a significant volume of biomass residuals, including black liquor at kraft pulp mills. These biomass residuals serve as the primary source of energy to run the mills. On average, about two-thirds of the energy powering forest products mills is derived from biomass. The study shows:

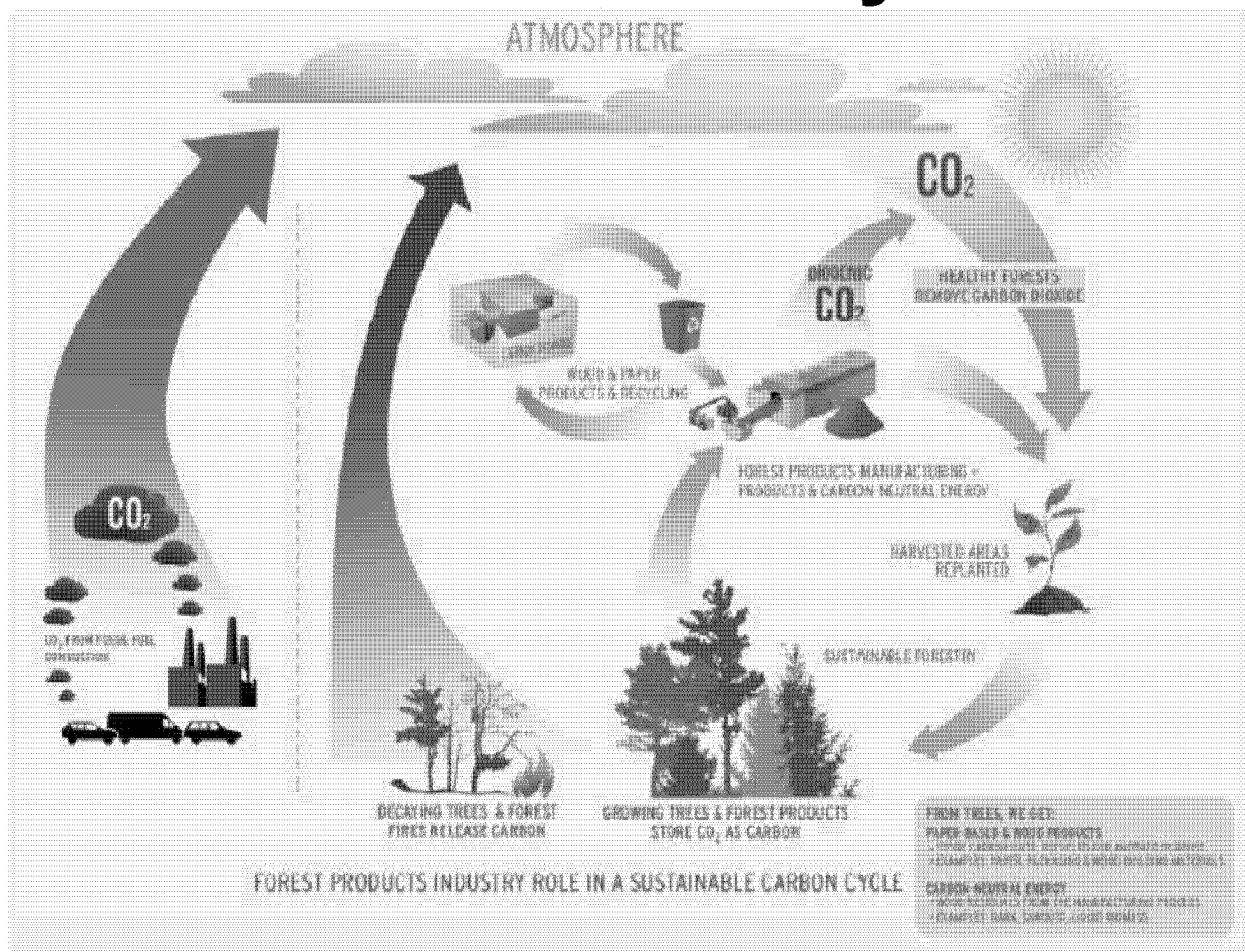
- There are substantial greenhouse gas reduction benefits in using biomass manufacturing residuals for energy in the forest products industry. Each year, the use of such biomass avoids the emission of approximately 218 million metric tons of CO₂e. This is equivalent to removing over 40 million cars from the road.
- The benefits of using biomass manufacturing residuals for energy have been rapidly realized:
 - Considering a weighted average of all residuals reflecting the volumes of their use, their greenhouse gas reduction benefits are superior to fossil fuels in much less than a year.
 - Even if the benefits of displacing fossil fuels with biomass residuals are ignored, on average using manufacturing residuals for energy produces within 2.4 years lower greenhouse gas emissions than landfilling or incinerating them.
 - When considering its ongoing production and use of biomass energy over many years, the U.S. forest products industry is producing net greenhouse gas benefits by using biomass energy as its major energy source.
- If the U.S. forest products industry did not use biomass residuals and relied solely on fossil fuels for energy, the ultimate releases of greenhouse gases would more than quadruple.

AF&PA Recommendations

- Manufacturing residuals used for biomass energy by the forest products industry should be assigned a biogenic accounting factor of zero and treated as carbon neutral, regardless of whether the region is a sink or a source. These biomass residuals would have released greenhouse gases to the atmosphere anyway if they had not been used for energy. They also displace fossil fuels.
- EPA's accounting framework should treat all forest-derived biomass as carbon neutral where the growth rate of forests is greater than or equal to harvest levels.
- EPA should base its accounting framework on the data produced by the Forest Inventory and Analysis (FIA) program administered by the U.S. Forest Service. EPA should adopt a broad regional approach for the framework, consistent with four FIA regions. The FIA program should be well-funded so the data is robust.
- EPA should use a reference point baseline. An anticipated future baseline, which would have to rely on complex modeling, is neither practical nor workable.
- EPA's accounting framework should be simple, efficient for the entire supply chain, and based on the best available science. For example, the framework should be designed so it will not inhibit the participation of small landowners in the market.

- Public policies should not construct artificial mandates or incentives, which disrupt the nation's existing efficient and balanced forest biomass markets.
- Public policies should recognize that sustainably managed forests and forest products sequester and store carbon and reduce greenhouse gases.

Biomass Carbon Cycle



From: Gunning, Paul
To: Irving, Bill; Kocchi, Suzanne
Sent: 12/19/2013 10:11:35 AM
Subject: FW: biomass
Attachments: Biogenic CO2 Status Update for Admin 12-19-2013 with chart.docx

-----Original Message-----

From: Stewart, Lori
Sent: Thursday, December 19, 2013 9:56 AM
To: Stewart, Lori; Koerber, Mike; McCabe, Janet; Wood, Anna; Page, Steve; Zenick, Elliott; Doster, Brian; Kornylak, Vera S.; Santiago, Juan; Goffman, Joseph; Dunham, Sarah; Gunning, Paul
Cc: Knapp, Kristien; Atkinson, Emily
Subject: RE: biomass

Resending with the chart included in the file and a few cleanup edits.

-----Original Message-----

From: Stewart, Lori
Sent: Thursday, December 19, 2013 9:49 AM
To: Koerber, Mike; McCabe, Janet; Wood, Anna; Page, Steve; Zenick, Elliott; Doster, Brian; Kornylak, Vera S.; Santiago, Juan; Goffman, Joseph; Dunham, Sarah; Gunning, Paul
Cc: Knapp, Kristien; Atkinson, Emily
Subject: RE: biomass

Thanks all. I am attaching a redline of the version Mike sent that incorporates Janet and Joe's edits, as well as a clean version. In response to Mike's question from a separate email, yes, Janet will lead the briefing.

-----Original Message-----

From: Koerber, Mike
Sent: Thursday, December 19, 2013 8:55 AM
To: McCabe, Janet; Wood, Anna; Page, Steve; Zenick, Elliott; Doster, Brian; Kornylak, Vera S.; Santiago, Juan; Goffman, Joseph; Dunham, Sarah; Gunning, Paul
Cc: Stewart, Lori; Knapp, Kristien; Atkinson, Emily
Subject: RE: biomass

The attachment adds OAQPS' comments to those sent by OAP earlier this morning.

-----Original Message-----

From: McCabe, Janet
Sent: Wednesday, December 18, 2013 11:22 PM
To: Wood, Anna; Koerber, Mike; Page, Steve; Zenick, Elliott; Doster, Brian; Kornylak, Vera S.; Santiago, Juan; Goffman, Joseph; Dunham, Sarah; Gunning, Paul
Cc: McCabe, Janet
Subject: biomass

Hey guys,

I know that Joe had some suggestions for the chart this afternoon that I hope you've had a chance to look at. I've done a bit of work on

Ex. 5 - Deliberative

Ex. 5 - Deliberative

We were supposed to get this into Gina's book tonight. She said it would be ok if I got her this (and the chart) first thing in the morning, so if you could take a look and let me know by 9, I'd really appreciate it. I realize this is ridiculously fast turnaround, but most of the memo is essentially what you sent forward, and I'm also prepared to tell her that it's still a work in progress.

From: Kornylak, Vera S.
To: Kocchi, Suzanne; Jenkins, Jennifer; Irving, Bill
Sent: 12/18/2013 4:36:47 PM
Subject: FW: Draft Materials in Prep for Biomass Meeting with the Administrator
Attachments: Biogenic CO2 Status Update for Admin 12_19_13 goffman 12-19.docx

See below – I think he may have edited the chart – the paper didn't look too different at first glance.

From: South, Peter
Sent: Wednesday, December 18, 2013 3:13 PM
To: Santiago, Juan; Kornylak, Vera S.
Cc: Koerber, Mike; Wood, Anna; Heilig, Johnetta; Johnson, Yvonne W; Ling, Michael; Long, Pam; Lorang, Phil; Mathias, Scott
Subject: FW: Draft Materials in Prep for Biomass Meeting with the Administrator

First round of edits from Joe—we may receive additional edits.

Thanks

From: Knapp, Kristien
Sent: Wednesday, December 18, 2013 2:55 PM
To: South, Peter
Subject: RE: Draft Materials in Prep for Biomass Meeting with the Administrator

Pete – Janet and Joe are still reviewing these materials. Joe's already edited the chart, and this is what it looks like currently. He asked that I send his edits to OAQPS and OAP so that you know where it stands. Can you circulate to the right folks?

Thanks,
Kristien

From: South, Peter
Sent: Tuesday, December 17, 2013 2:07 PM
To: OAR Special Assistants
Cc: Kornylak, Vera S.; Krieger, Jackie; Koerber, Mike; Heilig, Johnetta; Johnson, Yvonne W; Ling, Michael; Long, Pam; Lorang, Phil; Mathias, Scott; Santiago, Juan
Subject: RE: Draft Materials in Prep for Biomass Meeting with the Administrator

Hi Kristien,
As I noted earlier today, I have attached the revised biomass materials in prep for Thursday's meeting (several inserts/deletions). I apologize for the inconvenience. Thanks and give me a call with any questions.

-Pete

From: South, Peter
Sent: Monday, December 16, 2013 4:35 PM
To: OAR Special Assistants
Cc: Kornylak, Vera S.; Krieger, Jackie; Koerber, Mike; Heilig, Johnetta; Johnson, Yvonne W; Ling, Michael; Long, Pam; Lorang, Phil; Mathias, Scott; Santiago, Juan
Subject: Draft Materials in Prep for Biomass Meeting with the Administrator

Hi Kristien,
I have attached the draft biomass materials in prep for the meeting with the Administrator on Thursday. Please send me the slides once they are final/sent to the third floor.

Thanks and call me or Mike with questions.

Pete South
OAR/OAQPS/IO
U.S. EPA
office: 919 541-5359
cell: 919 599-7213

Organizer:	Ex - Personal Privacy: Gina McCarthy		Sent:	Mon 12/9/2013 1:44 PM
Subject:	Meeting re: Biogenic CO2 Update			
Location:	Aim Conference Room - Dial In	Ex - Personal Privacy	Video Conference Required: RTP Room C401A	
Start time:	Thu 12/19/2013	2:45 PM	All day event	
End time:	Thu 12/19/2013	3:45 PM		

SCt: Alison Kukla; Ct: Emily Atkinson, 202-564-1850
To: Ex - Personal Privacy: Gina McCarthy; Carter, Donnell; Gibson, John; McClain, Mike; Rodgers, Crystal; Slotkin, Ron; Vitalien, Christal; McCabe, Janet; Goffman, Joseph; Powers, Tom; Page, Steve; Koerber, Mike; Wood, Anna; Santiago, Juan; Kornylak, Vera S.; Schmidt, Lorie; Doster, Brian; Jordan, Scott; Dunham, Sarah; Irving, Bill; Kocchi, Suzanne; Jenkins, Jennifer; Ohrel, Sara; Sherry, Christopher; Zenick, Elliott; Hannon, John; Atkinson, Emily

From: Jenkins, Jennifer
To: Irving, Bill
CC: Kocchi, Suzanne
Sent: 12/17/2013 11:31:30 AM
Subject: RE: Draft Materials in Prep for Biomass Meeting with the Administrator
Attachments: Biogenic CO2 Status admin 12_19_13_sk jcj v2.docx

Updated version including Bill's edits to the Table (plus changing "anyways emissions" to "anyway emissions") in the Table

From: Irving, Bill
Sent: Tuesday, December 17, 2013 11:27 AM
To: Jenkins, Jennifer
Cc: Kocchi, Suzanne
Subject: RE: Draft Materials in Prep for Biomass Meeting with the Administrator

I think this looks fine – if we're still editing, then I think

Ex. 5 - Deliberative

Ex. 5 - Deliberative

From: Jenkins, Jennifer
Sent: Tuesday, December 17, 2013 11:25 AM
To: Irving, Bill
Cc: Kocchi, Suzanne
Subject: FW: Draft Materials in Prep for Biomass Meeting with the Administrator

+Bill

From: Jenkins, Jennifer
Sent: Tuesday, December 17, 2013 11:24 AM
To: Kocchi, Suzanne
Subject: RE: Draft Materials in Prep for Biomass Meeting with the Administrator

Here are my suggested edits. Tried to reflect

Ex. 5 - Deliberative

Ex. 5 - Deliberative

From: Kocchi, Suzanne
Sent: Tuesday, December 17, 2013 9:52 AM
To: Krieger, Jackie; Gunning, Paul
Cc: Friedman, Kristina; Jenkins, Jennifer; Irving, Bill
Subject: RE: Draft Materials in Prep for Biomass Meeting with the Administrator
Importance: High

Jackie – In the interest of time, attached is a track change version of the document that reflects what we think are Sarah's edits. I've cc'd Jen as well who is going to take a quick look concurrently to make sure the edits didn't inadvertently change the meaning. Vera Kornylak in OAQSP is going to try to get the edits in (and Paul has left a vm for Anna). They would like them ASAP and preferably by noon. Can you please let us know if this is ok with Sarah? We are all in mtgs until 11 am. Thanks- Suzie

From: Krieger, Jackie
Sent: Monday, December 16, 2013 5:22 PM
To: Gunning, Paul
Cc: Kocchi, Suzanne; Friedman, Kristina
Subject: FW: Draft Materials in Prep for Biomass Meeting with the Administrator

Paul – I just ran through this with Sarah. She wanted me to ask you if you are sure that all of the changes you and she discussed are included. Particularly in the chart. She had a few additional comments on the bullet page I can convey to you tomorrow.

From: South, Peter

Sent: Monday, December 16, 2013 4:35 PM

To: OAR Special Assistants

Cc: Kornylak, Vera S.; Krieger, Jackie; Koerber, Mike; Heilig, Johnetta; Johnson, Yvonne W; Ling, Michael; Long, Pam; Lorang, Phil; Mathias, Scott; Santiago, Juan

Subject: Draft Materials in Prep for Biomass Meeting with the Administrator

Hi Kristien,

I have attached the draft biomass materials in prep for the meeting with the Administrator on Thursday. Please send me the slides once they are final/sent to the third floor.

Thanks and call me or Mike with questions.

Pete South

OAR/OAQPS/IO

U.S. EPA

office: 919 541-5359

cell: 919 599-7213

Organizer:	Ex. 6 - Personal Privacy Administrator	Sent: Mon 12/9/2013 1:44 PM
Subject:	Meeting re: Biogenic CO2 Update	
Location:	Aim Conference Room - Dial In: (b)(6) personal privacy Video Conference Required: RHP Room C401A	
Start time:	Thu 12/19/2013 2:45 PM	All day event
End time:	Thu 12/19/2013 3:45 PM	

SCt: Alison Kukla; Ct: Emily Atkinson, 202-564-1850

To: Ex. 6 - Personal Privacy Administrator; Carter, Donnell; Gibson, John; McClain, Mike; Rodgers, Crystal; Slotkin, Ron; Vitalien, Christal; McCabe, Janet; Goffman, Joseph; Powers, Tom; Page, Steve; Koerber, Mike; Wood, Anna; Santiago, Juan; Kornylak, Vera S.; Schmidt, Lorie; Doster, Brian; Jordan, Scott; Dunham, Sarah; Irving, Bill; Kocchi, Suzanne; Jenkins, Jennifer; Ohrel, Sara; Sherry, Christopher; Zenick, Elliott; Hannon, John; Atkinson, Emily

In Shared Folder:  McCabe, Janet

Last modified by McCabe, Janet on Thu 12/12

From: Jenkins, Jennifer
To: Irving, Bill; Ohrel, Sara; Cole, Jefferson
CC: Kocchi, Suzanne
Sent: 12/13/2013 11:01:56 AM
Subject: RE: recent Team Biomass tasks - pls review and edit as needed

Yes, thanks Sara! This is terrific.

I think that's a great idea to check in with Brian and Elliott. That probably needs to happen on Monday too, if we are going to use that as input to the briefing for the Administrator on Thursday?

From: Irving, Bill
Sent: Friday, December 13, 2013 10:58 AM
To: Ohrel, Sara; Jenkins, Jennifer; Cole, Jefferson
Cc: Kocchi, Suzanne
Subject: RE: recent Team Biomass tasks - pls review and edit as needed

Sara - Thanks. This is a really helpful status update. An additional thought on the "Elliott" plan - it would help to have

Ex. 5 - Deliberative

Ex. 5 - Deliberative

from Elliott and Brian, I think they would find this discussion useful too.

From: Ohrel, Sara
Sent: Friday, December 13, 2013 10:48 AM
To: Jenkins, Jennifer; Cole, Jefferson
Cc: Kocchi, Suzanne; Irving, Bill
Subject: recent Team Biomass tasks - pls review and edit as needed

Tasks & Reminders as derived from recent emails: 12/12/13

- Use updated feedstock table from Suzie in 12/12 document

Forest certification

- Sarah would like a ½ pager to a one pager that contains the following info (draft by Tue 12/17)

Ex. 5 - Deliberative

"Elliott plan"

- 12/11 email from Suzie to Sara per the "Elliott plan": Paul wants you guys to

Ex. 5 - Deliberative

Ex. 5 - Deliberative

Ex. 5 - Deliberative

12/11 emails from Suzie to Sara: So we need 4 SIMPLE bullet points -

Ex. 5 - Deliberative

Ex. 5 - Deliberative

Sara Bushey Ohrel
Climate Economics Branch
Climate Change Division
U.S. Environmental Protection Agency
Phone: (202) 343-9712
Cell: (202) 341-6748

From: Kocchi, Suzanne
To: Kornylak, Vera S.; Jenkins, Jennifer; Irving, Bill; Ohrel, Sara; Sherry, Christopher; Jordan, Scott; Doster, Brian; Mangino, Joseph; Montanez, Jessica; Brooks, MichaelS
CC: Santiago, Juan
Sent: 12/10/2013 4:14:56 PM
Subject: Re: Upcoming biogenic CO2 briefings

Sounds good. Thanks for the heads up. We have an update with Sarah D on the calendar for 4 pm Wed (tmrw) so assuming that holds given the snow day today would be great if we could have a draft to share with her.

I think probably the key thing to convey;

Ex. 5 - Deliberative

Ex. 5 - Deliberative

Ps: sun is out here too

From: Kornylak, Vera S.
Sent: Tuesday, December 10, 2013 3:17:06 PM
To: Kocchi, Suzanne; Jenkins, Jennifer; Irving, Bill; Ohrel, Sara; Sherry, Christopher; Jordan, Scott; Doster, Brian; Mangino, Joseph; Montanez, Jessica; Brooks, MichaelS
Cc: Santiago, Juan
Subject: Upcoming biogenic CO2 briefings

Folks: I hope you (DC folks) are enjoying your snow day! We just got a bunch of rain although it's sunny now.

Just a heads up that

Ex. 5 - Deliberative

Ex. 5 - Deliberative

Thanks so much for all your work.
-Vera

From: Kocchi, Suzanne
Sent: Monday, December 09, 2013 4:04 PM
To: Kornylak, Vera S.; Jenkins, Jennifer; Irving, Bill; Ohrel, Sara; Sherry, Christopher; Jordan, Scott; Doster, Brian; Mangino, Joseph; Montanez, Jessica; Brooks, MichaelS
Cc: Santiago, Juan
Subject: RE: Draft Administrator power point
Importance: High

Vera – Here are our edits. I will note our technical experts did not get to comment on your slides overall although they did comment on the “OAP slides” we have inserted. It is possible we could have a few more edits (and we have a check in with Sarah D on Wed afternoon and she might have comments) but in the interest of time we wanted to get this back to you now.

Our edits are in strikethrough, red text and comment boxes. The main edit we made is

Ex. 5 - Deliberative

Ex. 5 - Deliberative

Please let us know if you have any questions/comments. We will probably check back in Wed to get the latest version (even if it is not final to make sure we are using an up to date version with Sarah).

Also, Jen is on travel to San Francisco (back Thur night) so there might be a time lag if you need something from her specifically. The rest of us are here in town though.

Thanks- Suzie

From: Kornylak, Vera S.

Sent: Friday, December 06, 2013 12:56 PM

To: Jenkins, Jennifer; Irving, Bill; Kocchi, Suzanne; Ohrel, Sara; Sherry, Christopher; Jordan, Scott; Doster, Brian; Mangino, Joseph; Montanez, Jessica; Brooks, MichaelS

Cc: Santiago, Juan

Subject: Draft Administrator power point

Internal; Deliberative

Hi Everyone: attached please find a draft of the presentation for the forthcoming Janet McCabe and Administrator McCarthy briefings on biogenic CO2.

The presentation is based on an outline that Anna recommended as follows:

Ex. 5 - Deliberative

Joe also noted the following which is addressed here and would be addressed in talking points as well:

Ex. 5 - Deliberative

In some cases, I rearranged a few thoughts for flow, but since I anticipate comments from you all, it's likely this will be further reorganized. OAP – please note that I took a few slides from your presentation yesterday but please feel free to provide your own new slides, edits or whatever you think is best for this. Please also note I took out the option that

Ex. 5 - Deliberative

The Janet McCabe briefing is scheduled for 12/13 so it would be great if I could get any edits back by COB Monday (12/9) so I could get it to Anna and Juan for review on Tuesday.

Thanks everyone & have a great weekend.

Vera

From: Irving, Bill
To: Kocchi, Suzanne
Sent: 12/9/2013 1:26:39 PM
Subject: RE: if you are going to the CSIB business plan - can you pls send the biomass slides before it?
Attachments: Draft Administrator Status Briefing (OAP).pptx

Here it is – I think the stakeholder slides from OAQPS need some work.

From: Kocchi, Suzanne
Sent: Monday, December 09, 2013 12:23 PM
To: Irving, Bill
Subject: if you are going to the CSIB business plan - can you pls send the biomass slides before it?

That way when it is over, I can take the pen, to the extent I have additional edits and we can get to Vera by cob.

From: Jenkins, Jennifer
To: Irving, Bill
Sent: 12/5/2013 3:20:48 PM
Subject: FW: Suggestions on accounting framework presentations
Attachments: briefing on AF2 for OGC OAQPS 12 5 2013 + bld organization suggestions.pptx

Mind-engaging, part 2

Slide 2 of 2

(Again, I will respond when as soon as I can...)

From: Doster, Brian
Sent: Thursday, December 05, 2013 3:07 PM
To: Jenkins, Jennifer
Subject: Suggestions on accounting framework presentations

So here are my suggestions to help a non-technical mind like mine follow how the accounting framework works and how its being modified based on the SAB recommendations. These are reflected in slide 6-10 and 16-17 in the attached, which moves 4 or 5 of the slides and then adds a few things in red print to help transition or lay a foundation for the audience. This assumes the audience (like me) did not already have a general sense of how the accounting framework works and that the basic approach that I suggest merging together in slides 6-10 was already reflected in AF1. This probably assumes some other things incorrectly, but my goal here is just to share some conceptual ideas for how I would find it most helpful to walk through this. Feel free to use or not as you see fit depending on the intended audience.

From: Gunning, Paul
To: Irving, Bill
CC: Kocchi, Suzanne
Sent: 12/4/2013 5:21:18 PM
Subject: FW: Upcoming briefing for Gina on biomass

Bill - here is the email from Juan....

Thanks

Paul

-----Original Message-----

From: Santiago, Juan
Sent: Wednesday, December 04, 2013 1:36 PM
To: Wood, Anna; Kornylak, Vera S.
Cc: Gunning, Paul
Subject: RE: Upcoming briefing for Gina on biomass

We will get something together this week. The pre-brief for Janet just got scheduled for Friday the 13th so we have some time. Vera is in Atlanta at the APM meeting but will be back tomorrow. Most of the information requested has already been put together either for talking points or some internal briefing/meeting.

Paul, can you have your folks put together a slide or two on the framework and send it to us to incorporate into the overall briefing slides? It can be a word document and we will cut and paste it into Power Point.

Thanks!
Juan

-----Original Message-----

From: Wood, Anna
Sent: Wednesday, December 04, 2013 1:09 PM
To: Santiago, Juan; Kornylak, Vera S.
Cc: Gunning, Paul
Subject: Fw: Upcoming briefing for Gina on biomass

Fyi. We are on the hook to put this doc together so can you both please work with folks to get a draft put together. We will need to vet it with OAP and OGC to get their input. Not sure if any of regions need to be included - just let me know. Also let me know if you have any questions and pls advise on timing for having a draft briefing document for me to take a look at before we send it forward to Steve/Mike for their review. Adding Paul to keep him in the loop. Thx _____

From: Goffman, Joseph
Sent: Wednesday, December 04, 2013 12:41:39 PM
To: Wood, Anna
Cc: Gunning, Paul
Subject: Re: Upcoming briefing for Gina on biomass

Looks good. Let's also address whether

Ex. 5 - Deliberative

Ex. 5 - Deliberative

Thanks.

From: Wood, Anna
Sent: Wednesday, December 04, 2013 10:24:27 AM
To: Goffman, Joseph

Cc: Gunning, Paul
Subject: Upcoming briefing for Gina on biomass

Hi Joe, per our discussion yesterday, the feedback for preparing for Gina's briefing is as follows. Also, you recommended that we prebrief Janet next week before going to Gina. Pls advise if you have any additions or corrections to what is noted below for the briefing. Thx

The briefing should address and provide an update on where we are on addressing biomas and would touch on

Ex. 5 - Deliberative

From: Kocchi, Suzanne
To: Gunning, Paul; Irving, Bill
Sent: 12/4/2013 11:13:52 AM
Subject: RE: Upcoming briefing for Gina on biomass

Yes, Bill already told to the team prepare a few slides, including that, anticipating this request.

If you talk to Anna (and to Joe) and it comes up let's keep reiterating

Ex. 5 - Deliberative

Ex. 5 - Deliberative

-----Original Message-----

From: Gunning, Paul
Sent: Wednesday, December 04, 2013 11:11 AM
To: Kocchi, Suzanne; Irving, Bill
Subject: Re: Upcoming briefing for Gina on biomass

Good point. We will also have to bring in

Ex. 5 - Deliberative

Ex. 5 - Deliberative

From: Kocchi, Suzanne
Sent: Wednesday, December 04, 2013 11:06:59 AM
To: Gunning, Paul; Irving, Bill
Subject: RE: Upcoming briefing for Gina on biomass

Makes sense and I think we have existing materials for everything. One key point, it is subtle

Ex. 5 - Deliberative

-----Original Message-----

From: Gunning, Paul
Sent: Wednesday, December 04, 2013 10:59 AM
To: Kocchi, Suzanne; Irving, Bill
Subject: Fw: Upcoming briefing for Gina on biomass

Anna and I talked and are trying to get clarity from Joe (see below). Anna will ask Juan to put in the meeting request for Janet and then work with us to pull together the briefing (obviously drawing from existing materials).

From: Wood, Anna
Sent: Wednesday, December 04, 2013 10:24:27 AM
To: Goffman, Joseph
Cc: Gunning, Paul
Subject: Upcoming briefing for Gina on biomass

Hi Joe, per our discussion yesterday, the feedback for preparing for Gina's briefing is as follows. Also, you recommended that we prebrief Janet next week before going to Gina. Pls advise if you have any additions or corrections to what is noted below for the briefing. Thx

The briefing should address and provide an update on where we are on addressing biomass and would touch on

Ex. 5 - Deliberative

Ex. 5 - Deliberative

From: Jenkins, Jennifer
To: Irving, Bill; Sherry, Christopher; Ohrel, Sara; Santiago, Juan; Kornylak, Vera S.; Cole, Jefferson
Sent: 11/25/2013 1:53:54 PM
Subject: Fw: Materials for Discussion at 1pm Meeting on Biogenic Carbon
Attachments: NCASI slides for EPA meeting Nov 25 2013.pptx; Nov 23 2013 Summary of changes to report on manufacturing residuals.pdf

Here are the slides from the NCASI presentation -- pls forward as needed

From: Missimer, Katie <Katie_Missimer@afandpa.org> on behalf of Noe, Paul <Paul_Noel@afandpa.org>
Sent: Monday, November 25, 2013 1:49:23 PM
To: Jenkins, Jennifer
Cc: Noe, Paul
Subject: FW: Materials for Discussion at 1pm Meeting on Biogenic Carbon

Jennifer,

Here are the NCASI materials on their study on forest products manufacturing residuals.

From: Noe, Paul
Sent: Monday, November 25, 2013 1:35 PM
To: Goffman, Joseph; Browne, Cynthia; Gunning.paul@Epa.gov; Dunham.sarah@Epa.gov
Cc: Noe, Paul
Subject: Materials for Discussion at 1pm Meeting on Biogenic Carbon
Importance: High

Dear Joe Goffman, Cynthia Browne, Paul Gunning and Sarah Dunham:

For discussion at our 1pm meeting today on biogenic carbon accounting, attached are the slides NCASI will present on their study on forest products manufacturing residuals, as well as a summary of the changes made from the July draft to the final October report.

Best regards,

Paul

Paul Noe
Vice President for Public Policy
Paul_Noel@afandpa.org
(202) 463-2777
AMERICAN FOREST & PAPER ASSOCIATION
1101 K Street, N.W., Suite 700
Washington, D.C. 20005



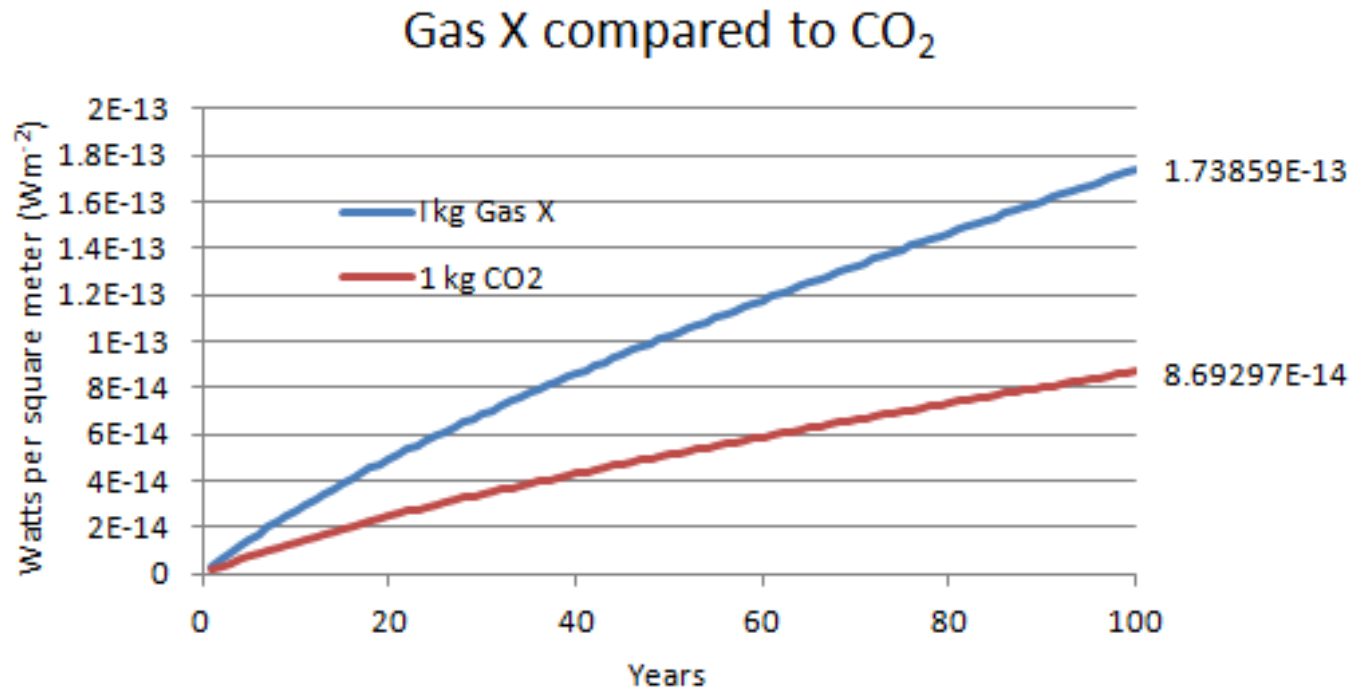
GHG emissions associated with using forest products industry manufacturing residuals for energy

Updated using dynamic modeling of radiative
forcing

NCASI
November 2013

Global Warming Potential (GWP)

GWP = cumulative radiative forcing from a pulse of gas compared to CO₂ over a period



- $1.73859 \text{ E-13} \div 8.69297 \text{ E-14} = 2.0$
- So 100-year GWP for Gas X is 2.0

IPCC (2006) GWPs for methane

GHG	20-Year	100-year
	IPCC GWPs	IPCC GWPs
Carbon Dioxide	1	1
Methane	72	25

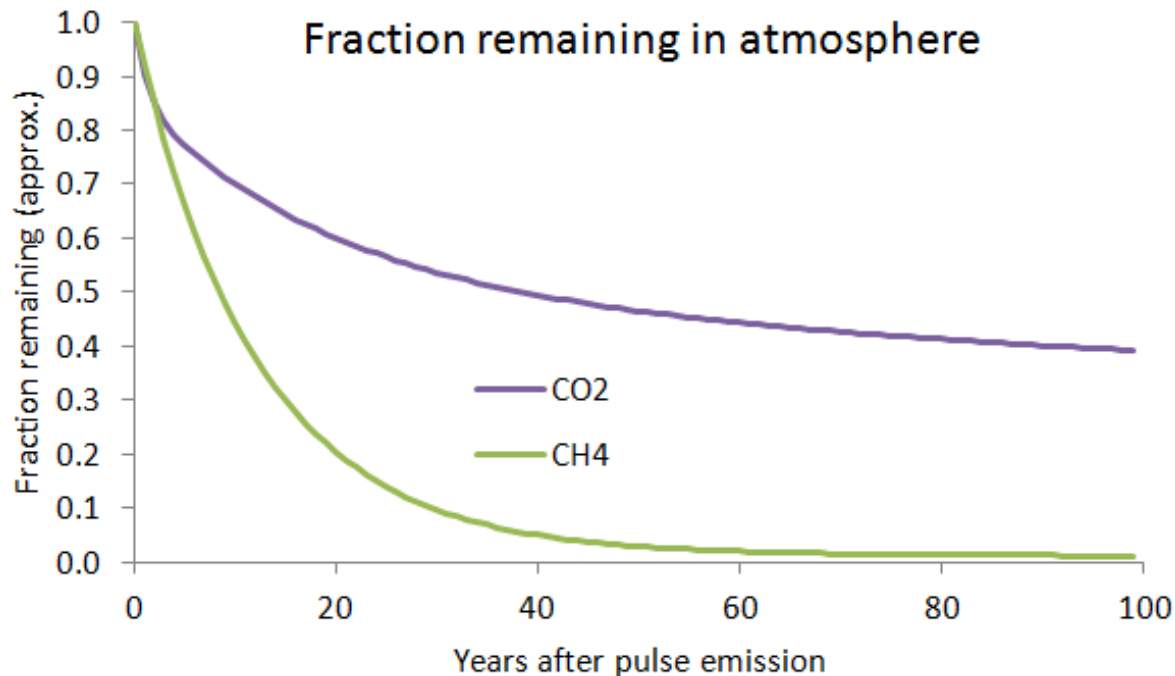
- Note dramatic decrease in methane GWP over time
- Cumulative radiative forcing is a function of;
 - Forcing “strength” of the gas compared to CO₂
 - Time the gas spends in the atmosphere compared to CO₂

Radiative forcing of CO₂ and CH₄

- The radiative forcing of a kg of CH₄ is far greater than the forcing from a kg of CO₂
 - In the first year of release;
 - CH₄ $\sim 170 \times 10^{-15} \text{ Wm}^{-2}$
 - CO₂ $\sim 1.7 \times 10^{-15} \text{ Wm}^{-2}$
 - i.e. 1-year GWP for CH₄ ~ 100
- But, a kg of CH₄ in the atmosphere does not last as long as a kg of CO₂

CH₄ and CO₂ have different fates in the atmosphere

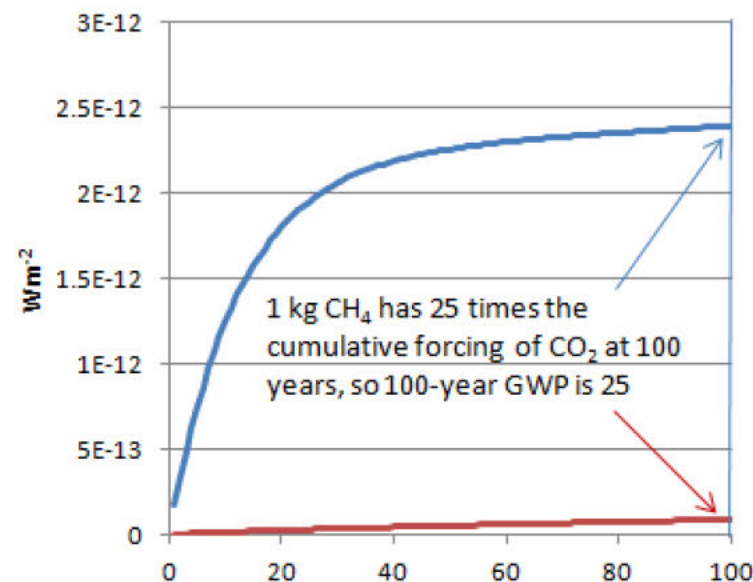
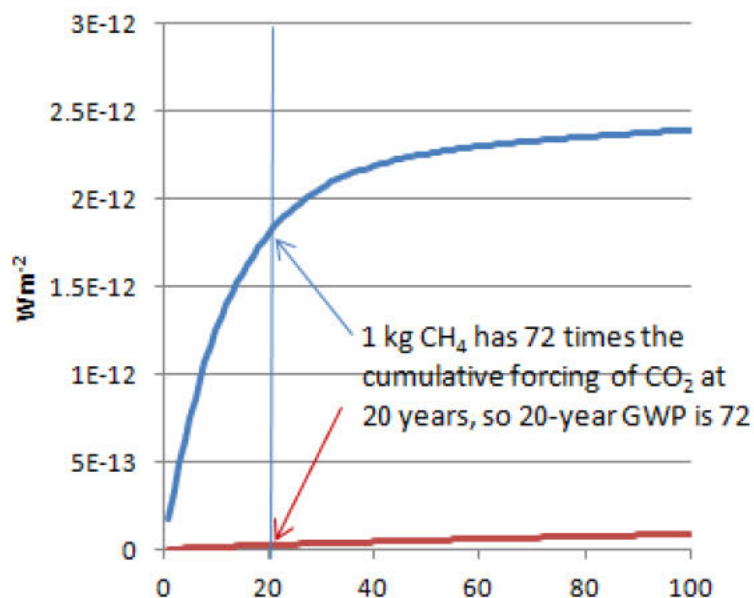
- CO₂ slowly removed by oceans and photosynthesis
- CH₄ primarily oxidized to CO₂ – Occurs fairly rapidly



- This means that the radiative forcing impact for methane is concentrated in the early years after release

Cumulative radiative forcing: CO₂ and CH₄

Considering potency and time in the atmosphere



- Accounting for the high radiative forcing of methane and its fate in the atmosphere are essential to understanding the timing of impacts from CH₄
 - 100-year GWPs, because they reflect only cumulative impacts at 100 years, understate the importance of methane in early years after release

More information on dynamic modeling of radiative forcing

- Levasseur, A. et al. 2010. Considering time in LCA: Dynamic LCA and its application to global warming impact assessments. Environ. Sci. Technol. 44 (8), pp 3169–3174
- Alvarez, R.A. et al. 2012. Greater focus needed on methane leakage from natural gas infrastructure. PNAS 109(17), pp 6435-6440
- Tool available:
 - Levasseur, A. 2013. DynCO2 Dynamic Carbon Footprinter. Montreal, QC: CIRAIG.
<http://www.ciraig.org/en/dynco2.php>

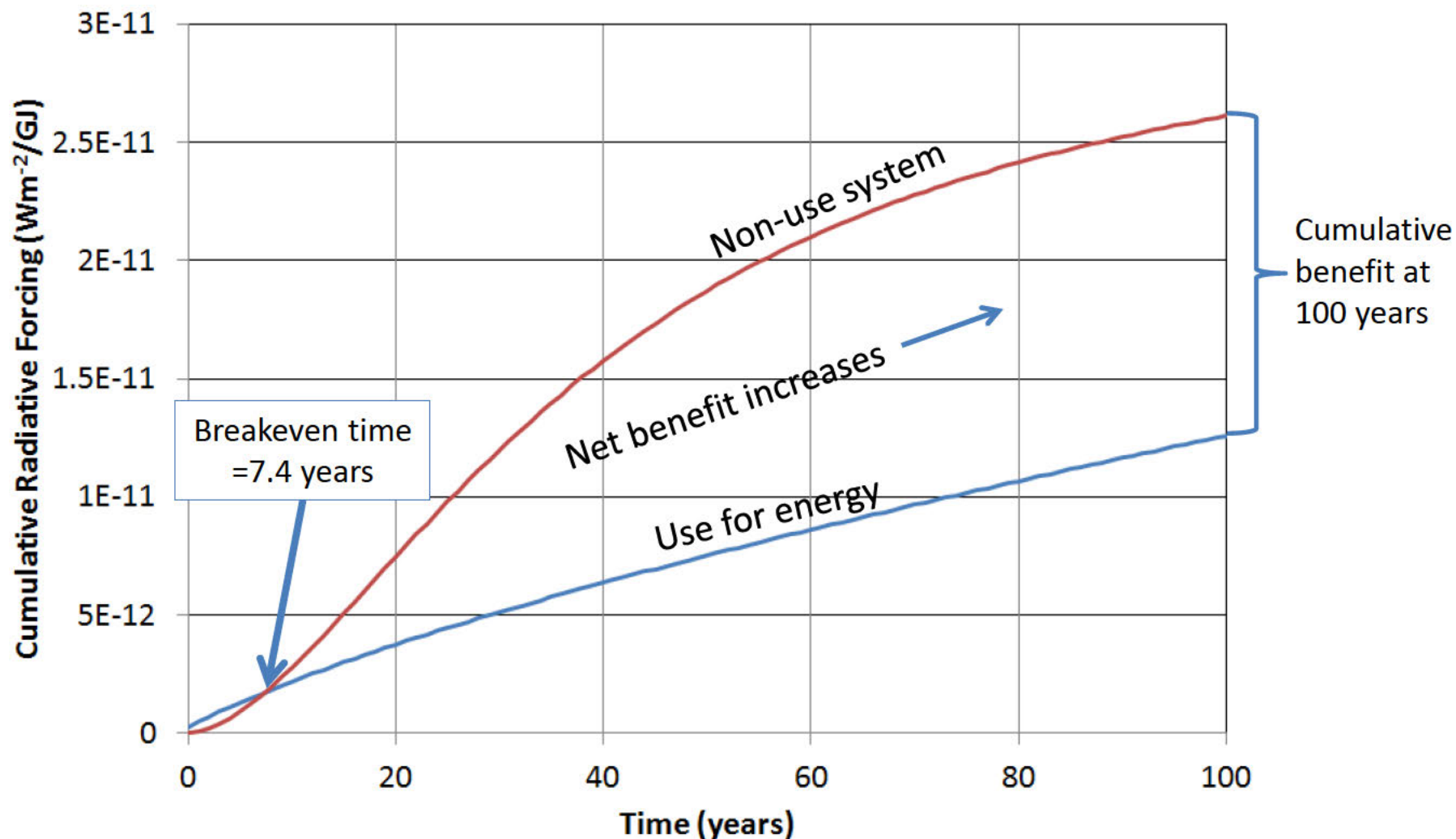
Study of GHG emissions from using and not using manufacturing residuals for energy

- Compare two systems
 1. Use manufacturing residuals for energy in forest product manufacturing facilities
 - Black liquor and woody mill residuals (e.g. bark, sawdust) comprise the large majority of biomass residues used for energy in the forest products industry
 2. Dispose of manufacturing residuals (mostly via landfilling) and use fossil fuels to produce energy
- Look at life cycle GHG emissions for both systems
- Do comparisons twice
 - Including fossil fuel substitution benefits
 - Excluding these benefits (i.e. consider only biogenic emissions)
- Look at difference in emissions as a function of time
 - Break even times
 - Cumulative difference at 100 years

Dynamic calculation of radiative forcing applied to the study of manufacturing residuals

1. For both systems, calculate GHG emissions in the year the residuals are used (or disposed) and every year thereafter out to 100 years
 - In system using residuals, only emissions are in year 1
 - In system not using residuals, emissions occur in year 1 plus there are emissions in subsequent years as material degrades in the landfill releasing biogenic CO₂ and biogenic CH₄
2. Considering each year's emissions and each year's removals from the atmosphere of previously emitted GHGs, calculate the GHGs in the atmosphere
3. Each year, determine the radiative forcing associated with the GHGs in the atmosphere (from current and past years), then determine the cumulative radiative forcing year-by-year
4. Compare the cumulative forcing of the system using residuals to the cumulative forcing of the system disposing of the residuals
Determine the point where they are equal (breakeven point) and determine the cumulative difference at 100 years

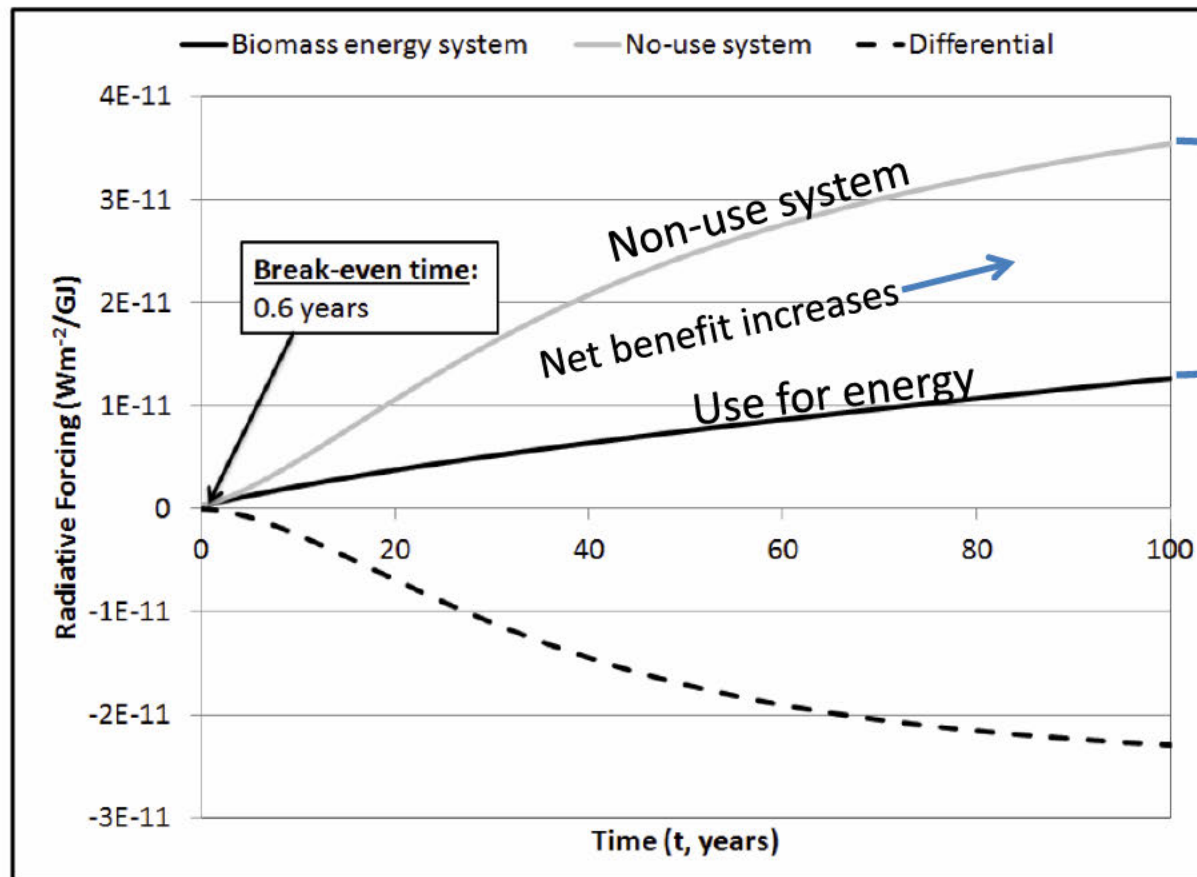
Graphically: Woody mill residuals not including fossil fuel substitution benefits



Time for Biomass Energy Systems to Have Lower Cumulative Radiative Forcing from Biogenic GHG Emissions Than the Corresponding Non-Use Systems, Without Fossil Fuel Substitution

Residual Type	Correct Break-Even Time (based on dynamic modeling) (years)	Previous Break-Even Time (based on 100-yr GWPs) (years)
Woody mill residuals	7.4	18.0
WWTP residuals	5.9	13.8
Paper recycling residuals	7.7	18.2
Black liquor	0	0
Weighted average of manufacturing residuals	2.4	5.9

Graphically: Woody mill residuals including fossil fuel substitution benefits



Using woody mill residuals for energy in the forest products industry for one year avoids 110 million tonnes CO_2E , cumulatively over 100 years

Figure 6.3 Cumulative GHG Impact for the Biomass Energy and Non-use Systems: Woody Mill Residuals - Typical Scenario

Time for Biomass Energy Systems to Have Lower Cumulative Radiative Forcing from GHG Emissions (Including Biogenic CO₂) Than the Corresponding Non-Use Systems, Considering Fossil Fuel Substitution

Residual Type	Correct Break-Even Time (based on dynamic modeling) (years)	Previous Break-Even Time (based on 100-yr GWPs) (years)
Woody mill residuals	0.6	3.6
WWTP residuals	0	1.9
Paper recycling residuals	0	0
Black liquor	0	0
Weighted average of manufacturing residuals	0.2	1.2

Summary: GHG Benefits of Using Mfg Residuals for Energy in the Forest Products Industry Rather than Disposing of the Residuals

- Considering only biogenic GHGs (ignoring fossil fuel displacement)
 - Under typical scenarios, net GHG emissions at 100 years are always zero or negative
 - Time required to realize net zero emissions impact is short
 - Less than 8 years for individual residues
 - Less than 3 years for the average mix of residues
 - Dynamic modeling of radiative forcing is critical to understanding the timing of impacts
 - Looked at as an ongoing practice under typical scenarios
 - Appears reasonable to conclude that any “carbon debt” has already been recovered
- If benefits of displacing fossil fuels are included, the breakeven times are much shorter and the benefits much greater
 - Given current practices, using manufacturing residuals for energy in the industry for one year avoids emissions greater than 3 times the industry’s annual GHG emissions from fossil fuel combustion

Thank you

Questions?



NATIONAL COUNCIL FOR AIR AND STREAM IMPROVEMENT, INC.
P.O. Box 13318, Research Triangle Park, NC 27709-3318
Phone (919) 941-6400 Fax (919) 941-6401

Reid A. Miner
Vice President -
Sustainable Manufacturing
Phone (919) 941-6407
Fax (919) 941-6401
e-mail RMiner@ncasi.org

NCASI Study on the GHG Benefits of using Biomass Manufacturing Residuals for Energy: Revisions to Improve the Understanding of the Timing of Impacts

Reid Miner and Caroline Gaudreault, NCASI

November 23, 2013

Following the July 25, 2013 meeting with EPA, NCASI gave additional thought to the method it had used to estimate the timing of GHG emissions and GHG emissions impacts. In the results presented to EPA during the July meeting, the impacts of emissions over time were estimated by multiplying the emissions in a given year by the associated 100-year global warming potential (GWP) and then calculating the cumulative emissions impact over time, in units of CO₂ equivalents. NCASI realized shortly after the meeting, however, that this approach does not correctly characterize radiative forcing impacts in the atmosphere over time. This is because a 100-year global warming potential is a single value reflecting the cumulative radiative forcing over 100 years associated with a single pulse emission of a GHG.¹ All of the 100-year cumulative forcing impact is attached to emissions at the time the emissions occur. To understand timing, however, one needs to characterize the year-to-year radiative forcing associated with the GHGs emissions remaining in the atmosphere. NCASI, therefore, has recalculated the results of its study using a more appropriate calculation method that accounts for radiative forcing over time. Hereafter we refer to this as the “dynamic approach.” Examples in the literature of using the dynamic approach to examine the GHG impacts of energy systems include the articles by Levasseur et al.² and by Alvarez et al.³

The dynamic approach starts with the same GHG emissions estimates as used in the earlier results shared with EPA. Each year’s emissions, however, are tracked in the atmosphere over time as they decompose or are removed from the atmosphere. The radiative forcing associated with the GHGs remaining the atmosphere in each year is calculated and the cumulative radiative forcing is tracked over time. The point in time where the two systems (one using residuals for energy and the other disposing of the residues) have equal cumulative radiative forcing is the “break even” time. For the rest of the 100-year period, the radiative forcing associated with using residuals for energy is lower than the forcing associated with disposing of the residuals.

¹ Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Chapter 2 [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press

² Levasseur, A. et al. 2010. Considering time in LCA: Dynamic LCA and its application to global warming impact assessments. Environ. Sci. Technol. 44 (8), pp 3169–3174

³ Alvarez, R.A. et al. 2012. Greater focus needed on methane leakage from natural gas infrastructure. PNAS 109(17), pp 6435-6440

One other difference from the original results shown to EPA on July 25th involves the modeling of methane in the atmosphere. IPCC's 100-year global warming potentials for methane do not consider the radiative forcing of the CO₂ formed as methane decomposes in the atmosphere. The reason has to do with how carbon is tracked in international GHG inventories under IPCC guidelines.¹ For a study focused on the timing of impacts of two systems, however, this CO₂ needs to be considered.

To do the radiative forcing calculations, NCASI used a tool developed by researchers at the Interuniversity Research Centre for the Life Cycle of Products, Processes and Services (CIRAIG) at École Polytechnique de Montréal.⁴ This is the same group of CIRAIG researchers who published the Levasseur et al. paper mentioned above. The tool is based on the same equations used by IPCC to calculate global warming potentials, except that the tool also accounts for the radiative forcing of CO₂ resulting from the decomposition of methane in the atmosphere.

To ensure that the CIRAIG tool was producing results expected using IPCC's equations (i.e. IPCC equations for decay of GHGs in the atmosphere and the radiative forcing associated with GHGs), NCASI used the dynamic tool to develop global warming potentials and compared them to those published by IPCC. The results are shown in Table 1. The tool produced results for nitrous oxide that were exactly the same as those published by IPCC. The tool produced global warming potentials for methane that were slightly higher than those published by IPCC, reflecting the fact that the tool includes the radiative forcing associated with CO₂ resulting from methane decomposition in the atmosphere while IPCC GWPs do not.

Table 1. Comparison of IPCC GWPs¹ to Results Obtained Using the CIRAIG Dynamic Carbon Footprint Calculator⁴

GHG	20-Year		100-year		500-year	
	IPCC GWPs	Dynamic Calculator	IPCC GWPs	Dynamic Calculator	IPCC GWPs	Dynamic Calculator
Methane	72	72.9	25	27.5	7.6	10.3
Nitrous Oxide	289	289	298	298	153	153

Using the dynamic approach has very little impact on the long term (100-year) benefits estimated for using manufacturing residuals for energy compared to disposing of these residuals. This is because in both systems (i.e. using residuals for energy vs. disposing of residues) most of the emissions occur early in the accounting period so over a 100-year period similar results for cumulative radiative forcing are obtained with the two methods. The break even times are significantly shorter using the dynamic approach, however, because scenario's involving the landfill disposal of residuals have methane emissions, and radiative forcing, concentrated in the early years of the simulation, something not revealed by using 100-year GWPs.

⁴ Levasseur, A. 2013. DynCO2 Dynamic Carbon Footprinter. Montreal, QC: CIRAIG. <http://www.ciraig.org/en/dynco2.php> (accessed August 2013).

In the tables below, the earlier results for break even times are compared to those calculated using the more accurate dynamic approach. The first table shows the results when you include the benefits of displacing fossil fuels (i.e. a full life cycle comparison) while the second does not (i.e. an analysis considering only biogenic emissions from the units receiving residuals).

Table 2. Time for Biomass Energy Systems to Have Lower Cumulative Radiative Forcing from GHG Emissions (Including Biogenic CO₂) Than the Corresponding Non-Use Systems, Considering Fossil Fuel Substitution

Residual Type	Correct Break Even Time (years)	Previous Break Even Time (years)
Woody mill residuals	0.6	3.6
WWTP residuals	0	1.9
Paper recycling residuals	0	0
Black liquor	0	0
Weighted average of manufacturing residuals	0.2	1.2

Table 3. Results of Analysis of Biogenic GHGs, Ignoring Fossil Fuel Substitution

Residual Type	Correct Break Even Time (years)	Previous Break Even Time (years)
Woody mill residuals	7.4	18.0
WWTP residuals	5.9	13.8
Fiber fraction of paper recycling residuals*	7.7	18.2
Black liquor	0	0
Weighted average of manufacturing residuals	2.4	5.9

** In addition to biomass, paper recycling residuals contain plastics which are produced from fossil fuels. For the purpose of the biomass carbon fate analysis, only the biomass fraction was considered.*

From: Irving, Bill
To: Jenkins, Jennifer
Sent: 10/22/2013 11:53:12 AM
Subject: RE: edits to AF2 Appendices
Attachments: AF2 (BI)

Here are A through E (other than B). More to come before Friday.

From: Jenkins, Jennifer
Sent: Tuesday, October 22, 2013 11:47 AM
To: Irving, Bill
Subject: edits to AF2 Appendices

Hey Bill –

Jut checking in with you about your edits to the Appendices... We are planning to deliver the next draft of AF2, with a few more details ironed out and loose ends tied, at our briefing with Paul on Nov 6. We are getting reviews f the full document back from a couple of key members (Gregg, Charlie, Neil) of the Technical Team next week. Do you think you can send your edits on the main body/ appendices by this Friday, Oct 25? We can integrate them into the Nov 6 draft next week.

thanks!
Jen

Jennifer C. Jenkins, Ph.D.
Climate Policy Branch
Climate Change Division, Office of Atmospheric Programs
US Environmental Protection Agency
202-343-9361
jenkins.jennifer@epa.gov

From: Jenkins, Jennifer
To: Kocchi, Suzanne; Irving, Bill
CC: Ohrel, Sara; Sherry, Christopher; Cole, Jefferson
Sent: 9/30/2013 3:33:54 PM
Subject: first draft of slides for Paul
Attachments: prebrief for paul 9.30.2013 v2.pptx

Very drafty

We will have handouts with the actual numbers for reference point, FABA, and waste -- intentional decision here not to put them in the ppt. Feedback?

Jennifer C. Jenkins, Ph.D.
Climate Policy Branch
Climate Change Division, Office of Atmospheric Programs
US Environmental Protection Agency
202-343-9361
jenkins.jennifer@epa.gov

From: Sherry, Christopher
To: Kocchi, Suzanne; Jenkins, Jennifer; Irving, Bill; Ohrel, Sara
Sent: 9/27/2013 10:00:59 AM
Subject: RE: Biomass Spreadsheet

A couple comments on the EGU NSPS mentions, and one other (all in red).

Ex. 5 - Deliberative

Ex. 5 - Deliberative

From: Kocchi, Suzanne
Sent: Thursday, September 26, 2013 5:31 PM
To: Jenkins, Jennifer; Irving, Bill; Ohrel, Sara; Sherry, Christopher
Subject: FW: Biomass Spreadsheet

Lisa G - You can ignore this table

Everyone else - assume we should send consolidated comments. Mine are as follows:

- 1) I think column G should be deleted for now, per our discussion. I still don't understand what it is trying to convey
- 2) Columns D and E/F should be reversed. **Ex. 5 - Deliberative**
- 3) The title of Columns D and E/F doesn't necessarily match up with the text in all the rows. I thought we talked about titling it something like **Ex. 5 - Deliberative** and then the bullets would provide a broad assessment for example the first row would look like:

Ex. 5 - Deliberative

From: Brooks, MichaelS
Sent: Thursday, September 26, 2013 5:00 PM
To: Jenkins, Jennifer; Doster, Brian; Kocchi, Suzanne; Irving, Bill; Ohrel, Sara; Sherry, Christopher; Zenick, Elliott; Jordan, Scott; Grogan-McCulloch, Lisa
Cc: Kornylak, Vera S.
Subject: Biomass Spreadsheet

Here is the spreadsheet for your review. Since the briefing is on Tuesday can you please have you edits back to Vera by COB tomorrow, 9/27?

Cheers,

Michael S. Brooks

<< File: Biogenic Action Impacts for Stakeholders 9-26-13 v2.xlsx >>

From: Kornylak, Vera S.
To: Jenkins, Jennifer; Ohrel, Sara
CC: Irving, Bill; Kocchi, Suzanne; Cole, Jefferson; Brooks, MichaelS
Sent: 9/5/2013 9:48:20 AM
Subject: latest power point
Attachments: Biogenic CO2 Deferral Briefing 9 4 13.pptx

Just in case you haven't seen, Mike Koerber had some edits which are represented here. I'll plan to turn the presentation to Jennifer for slide 8 and 23 (now in appendix). You'll also see that the options slides were moved to the appendix. My plan is still to walk through the options.

Talk to you later!
Vera

From: Jenkins, Jennifer
Sent: Wednesday, September 04, 2013 1:54 PM
To: Kornylak, Vera S.; Ohrel, Sara
Cc: Irving, Bill; Kocchi, Suzanne; Cole, Jefferson; Brooks, MichaelS
Subject: RE: OAP comments and suggested edits

Thanks Vera –

I will be at the briefing tomorrow and would be happy to walk through the OAP slide.

Would you forward the briefing package to us as well, when you send it up to OAR this afternoon?

Jen

Jennifer C. Jenkins, Ph.D.
Climate Policy Branch
Climate Change Division, Office of Atmospheric Programs
US Environmental Protection Agency
202-343-9361
jenkins.jennifer@epa.gov

From: Kornylak, Vera S.
Sent: Wednesday, September 04, 2013 10:05 AM
To: Ohrel, Sara
Cc: Jenkins, Jennifer; Irving, Bill; Kocchi, Suzanne; Cole, Jefferson; Brooks, MichaelS
Subject: RE: OAP comments and suggested edits

Thanks Sara – I've made the changes OAP suggested to the power point – but there may be additional tweaks as I do the OGC edits. I've moved your feedstock slide (thank you) to a more prominent position and I think it makes sense for someone from OAP to walk through that slide. Please let me know who I should turn the presentation over to at that point in time. I anticipate Janet/Joe having some questions on it since this may be the first they see it presented in this manner.

Also, I noticed a few comments in the document you sent me. I just cut/pasted them below with some general responses. If you have questions, please feel free to give me a call. I'm trying to finish the rest of the edits since we need to get this to the folks in DC for the briefing tomorrow.

Thanks!
Vera

Ex. 5 - Deliberative

From: Ohrel, Sara
Sent: Tuesday, September 03, 2013 5:14 PM
To: Kornylak, Vera S.; Brooks, MichaelS
Cc: Jenkins, Jennifer; Irving, Bill; Kocchi, Suzanne; Cole, Jefferson
Subject: OAP comments and suggested edits

Hello Vera and Michael,

As promised, attached you will find OAP comments on the 9/5 briefing package. Also attached is a suggested alternative to slide 22. Happy to discuss.

Thank you,
Sara

Sara Bushey Ohrel
Climate Economics Branch
Climate Change Division
U.S. Environmental Protection Agency
Phone: (202) 343-9712
Cell: (202) 341-6748

From: Jenkins, Jennifer
To: Kocchi, Suzanne; Irving, Bill; Ohrel, Sara; Sherry, Christopher; Cole, Jefferson
Sent: 9/5/2013 9:23:28 AM
Subject: FW:
Attachments: Biogenic CO2 Deferral Briefing 9 4 13 (3).pptx

Here is the most recent version. There may be some front office edits, so this is not 100% final.

From: Brooks, MichaelS
Sent: Thursday, September 05, 2013 9:22 AM
To: Jenkins, Jennifer
Subject: FW:

Cheers,

Michael S. Brooks

From: Wood, Anna
Sent: Wednesday, September 04, 2013 4:52 PM
To: South, Peter
Cc: Koerber, Mike; Kornylak, Vera S.; Santiago, Juan; Brooks, MichaelS; Mangino, Joseph; Johnson, Yvonne W
Subject:

Hi Pete, here is the briefing document with changes Mike requested. The only change we were not able to make is re the

Ex. 5 - Deliberative

 We will be able to talk through that when reviewing the charts so
hopefully that would work. Thanks, Anna

Anna Marie Wood
Director, Air Quality Policy Division
Office of Air Quality Planning and Standards, U.S. EPA
109 T.W. Alexander Drive
Research Triangle Park, NC 27711
(919) 541-3604
Fax. (919) 541-4028

From: Sherry, Christopher
To: Irving, Bill; Ohrel, Sara; Kocchi, Suzanne; Cole, Jefferson; Jenkins, Jennifer
Sent: 9/3/2013 4:58:30 PM
Subject: RE: Briefing document for biogenic CO2 briefing on 9/5
Attachments: Biogenic CO2 Deferral Briefing 8 30 13 jcj_sk_SO_BI_CS.pptx

A few additional comments, working off Bill's version, with minor comments on slides 7, 9, and 17. We need to make sure we also send over the replacement slide 22.

From: Irving, Bill
Sent: Tuesday, September 03, 2013 4:44 PM
To: Ohrel, Sara; Kocchi, Suzanne; Cole, Jefferson; Jenkins, Jennifer
Cc: Sherry, Christopher
Subject: RE: Briefing document for biogenic CO2 briefing on 9/5

Some additional comments attached, in green.

Also, I agree with Jeff's comment on broader stakeholder reaction.

<< File: Biogenic CO2 Deferral Briefing 8 30 13 jcj_sk_SO_BI.pptx >>

From: Ohrel, Sara
Sent: Tuesday, September 03, 2013 4:27 PM
To: Kocchi, Suzanne; Irving, Bill; Cole, Jefferson; Jenkins, Jennifer
Cc: Sherry, Christopher
Subject: RE: Briefing document for biogenic CO2 briefing on 9/5

ok, will do.

From: Kocchi, Suzanne
Sent: Tuesday, September 03, 2013 4:26 PM
To: Irving, Bill; Cole, Jefferson; Ohrel, Sara; Jenkins, Jennifer
Cc: Sherry, Christopher
Subject: RE: Briefing document for biogenic CO2 briefing on 9/5

Sara if you are free maybe shoot a quick note to Vera and Michael that our comments are coming shortly just so they know they will get something from us today.

From: Irving, Bill
Sent: Tuesday, September 03, 2013 4:25 PM
To: Cole, Jefferson; Ohrel, Sara; Kocchi, Suzanne; Jenkins, Jennifer
Cc: Sherry, Christopher
Subject: RE: Briefing document for biogenic CO2 briefing on 9/5

Sara - I'm taking a quick look now. Unlikely to have major edits but will a note shortly.

From: Cole, Jefferson
Sent: Tuesday, September 03, 2013 4:21 PM

To: Ohrel, Sara; Kocchi, Suzanne; Jenkins, Jennifer; Irving, Bill
Cc: Sherry, Christopher
Subject: RE: Briefing document for biogenic CO2 briefing on 9/5

Sara,

I do not have any line item edits. However,

Ex. 5 - Deliberative

Ex. 5 - Deliberative

Unfortunately, I do not know enough of the context to suggest any language in this effort.

Thanks,

Jeff

Jefferson Cole
Climate Economics Branch
Climate Change Division
U.S. Environmental Protection Agency
cole.jefferson@epa.gov
202.343.9671

From: Ohrel, Sara
Sent: Tuesday, September 03, 2013 3:40 PM
To: Cole, Jefferson; Kocchi, Suzanne; Jenkins, Jennifer; Irving, Bill
Cc: Sherry, Christopher
Subject: RE: Briefing document for biogenic CO2 briefing on 9/5

Hi all,
Here is my commented version of the PPT (Jeff, please work off this) as well as the suggested substitute version for slide 22. My suggested edits in green.
<< File: proof of concept BAF ranges SO.PPTX >> << File: Biogenic CO2 Deferral Briefing 8 30 13 jcj_sk_SO.pptx >>

From: Cole, Jefferson
Sent: Tuesday, September 03, 2013 3:35 PM
To: Ohrel, Sara; Kocchi, Suzanne; Jenkins, Jennifer; Irving, Bill
Cc: Sherry, Christopher
Subject: RE: Briefing document for biogenic CO2 briefing on 9/5

I will take a look at it soon and let you know if I have any further comments.

Thanks,

Jeff

Jefferson Cole
Climate Economics Branch
Climate Change Division
U.S. Environmental Protection Agency
cole.jefferson@epa.gov

From: Ohrel, Sara
Sent: Tuesday, September 03, 2013 3:34 PM
To: Kocchi, Suzanne; Jenkins, Jennifer; Irving, Bill
Cc: Sherry, Christopher; Cole, Jefferson
Subject: RE: Briefing document for biogenic CO2 briefing on 9/5

Hey all,
Just checking on this - I am about done adding my comments. Is anyone else planning to comment? If not, I will send all our comments over to Michael soon (as they are needed by COB today and I think Jen is out this afternoon). Please let me know if you plan to comment, and if so, by when.
Thanks!

From: Kocchi, Suzanne
Sent: Tuesday, September 03, 2013 10:16 AM
To: Jenkins, Jennifer; Irving, Bill
Cc: Ohrel, Sara; Sherry, Christopher; Cole, Jefferson
Subject: RE: Briefing document for biogenic CO2 briefing on 9/5

Minor comments on a few of the slides 10-14 and 16-17. I agree re: your suggestion on slide 22. Thanks.

<< File: Biogenic CO2 Deferral Briefing 8 30 13 jcj_sk.pptx >>

From: Jenkins, Jennifer
Sent: Friday, August 30, 2013 5:06 PM
To: Irving, Bill; Kocchi, Suzanne
Cc: Ohrel, Sara; Sherry, Christopher; Cole, Jefferson
Subject: FW: Briefing document for biogenic CO2 briefing on 9/5

All -

My comments on this briefing from OAQPS are attached. Also, Michael asked us for some more specifics on the Ex. 5 - Deliberative in place of slide 22.

Please provide your comments on this version on Tuesday and I will collate as needed - looks like they'd like to have our comments by COB Tuesday 9/3.

Thanks
Jen

<< File: proof of concept BAF ranges.PPTX >> << File: Biogenic CO2 Deferral Briefing 8 30 13 jcj.pptx >>

From: Kornylak, Vera S.
Sent: Friday, August 30, 2013 1:55 PM
To: Doster, Brian; Chapman, Apple; Kocchi, Suzanne; Jenkins, Jennifer; Zenick, Elliott; Jordan, Scott; Hannon, John; Irving, Bill
Cc: Wood, Anna; Santiago, Juan; Chapman, Apple; Schmidt, Lorie; Gunning, Paul
Subject: Briefing document for biogenic CO2 briefing on 9/5

Hello Everyone:

Attached please find the power point for your review for the upcoming briefing with Janet and Joe on 9/5. Please provide comments back (preferably by office) by COB Tuesday (or earlier!).

Thanks and I hope everyone has a great weekend.

Vera

<< File: Biogenic CO2 Deferral Briefing 8 30 13.pptx >>

From: Ohrel, Sara
To: Cole, Jefferson; Kocchi, Suzanne; Jenkins, Jennifer; Irving, Bill
CC: Sherry, Christopher
Sent: 9/3/2013 3:40:01 PM
Subject: RE: Briefing document for biogenic CO2 briefing on 9/5
Attachments: Biogenic CO2 Deferral Briefing 8 30 13 jcj_sk_SO.pptx; proof of concept BAF ranges SO.PPTX

Hi all,
Here is my commented version of the PPT (Jeff, please work off this) as well as the suggested substitute version for slide 22. My suggested edits in green.

From: Cole, Jefferson
Sent: Tuesday, September 03, 2013 3:35 PM
To: Ohrel, Sara; Kocchi, Suzanne; Jenkins, Jennifer; Irving, Bill
Cc: Sherry, Christopher
Subject: RE: Briefing document for biogenic CO2 briefing on 9/5

I will take a look at it soon and let you know if I have any further comments.

Thanks,

Jeff

Jefferson Cole
Climate Economics Branch
Climate Change Division
U.S. Environmental Protection Agency
cole.jefferson@epa.gov
202.343.9671

From: Ohrel, Sara
Sent: Tuesday, September 03, 2013 3:34 PM
To: Kocchi, Suzanne; Jenkins, Jennifer; Irving, Bill
Cc: Sherry, Christopher; Cole, Jefferson
Subject: RE: Briefing document for biogenic CO2 briefing on 9/5

Hey all,
Just checking on this - I am about done adding my comments. Is anyone else planning to comment? If not, I will send all our comments over to Michael soon (as they are needed by COB today and I think Jen is out this afternoon). Please let me know if you plan to comment, and if so, by when.
Thanks!

From: Kocchi, Suzanne
Sent: Tuesday, September 03, 2013 10:16 AM
To: Jenkins, Jennifer; Irving, Bill
Cc: Ohrel, Sara; Sherry, Christopher; Cole, Jefferson
Subject: RE: Briefing document for biogenic CO2 briefing on 9/5

Minor comments on a few of the slides 10-14 and 16-17. I agree re: your suggestion on slide 22. Thanks.

<< File: Biogenic CO2 Deferral Briefing 8 30 13 jcj_sk.pptx >>

From: Jenkins, Jennifer
Sent: Friday, August 30, 2013 5:06 PM
To: Irving, Bill; Kocchi, Suzanne
Cc: Ohrel, Sara; Sherry, Christopher; Cole, Jefferson
Subject: FW: Briefing document for biogenic CO2 briefing on 9/5

All -

My comments on this briefing from OAQPS are attached. Also, Michael asked us for

Ex. 5 - Deliberative

 in

Ex. 5 - Deliberative

 in
place of slide 22.

Please provide your comments on this version on Tuesday and I will collate as needed - looks like they'd like to have our comments by COB Tuesday 9/3.

Thanks
Jen

<< File: proof of concept BAF ranges.PPTX >> << File: Biogenic CO2 Deferral Briefing 8 30 13 jcj.pptx >>

From: Kornylak, Vera S.
Sent: Friday, August 30, 2013 1:55 PM
To: Doster, Brian; Chapman, Apple; Kocchi, Suzanne; Jenkins, Jennifer; Zenick, Elliott; Jordan, Scott; Hannon, John; Irving, Bill
Cc: Wood, Anna; Santiago, Juan; Chapman, Apple; Schmidt, Lorie; Gunning, Paul
Subject: Briefing document for biogenic CO2 briefing on 9/5

Hello Everyone:

Attached please find the power point for your review for the upcoming briefing with Janet and Joe on 9/5. Please provide comments back (preferably by office) by COB Tuesday (or earlier!).

Thanks and I hope everyone has a great weekend.

Vera

<< File: Biogenic CO2 Deferral Briefing 8 30 13.pptx >>

From: Jenkins, Jennifer
To: Irving, Bill; Kocchi, Suzanne
CC: Ohrel, Sara; Sherry, Christopher; Cole, Jefferson
Sent: 8/30/2013 5:06:27 PM
Subject: FW: Briefing document for biogenic CO2 briefing on 9/5
Attachments: Biogenic CO2 Deferral Briefing 8 30 13 jcj.pptx; Biogenic CO2 Deferral Briefing 8 30 13.pptx; proof of concept BAF ranges.PPTX

All -

My comments on this briefing from OAQPS are attached. Also, Michael asked us for some more specifics on the **Ex. 5 - Deliberative** in place of slide 22.

Please provide your comments on this version on Tuesday and I will collate as needed - looks like they'd like to have our comments by COB Tuesday 9/3.

Thanks
Jen

From: Kornylak, Vera S.
Sent: Friday, August 30, 2013 1:55 PM
To: Doster, Brian; Chapman, Apple; Kocchi, Suzanne; Jenkins, Jennifer; Zenick, Elliott; Jordan, Scott; Hannon, John; Irving, Bill
Cc: Wood, Anna; Santiago, Juan; Chapman, Apple; Schmidt, Lorie; Gunning, Paul
Subject: Briefing document for biogenic CO2 briefing on 9/5

Hello Everyone:

Attached please find the power point for your review for the upcoming briefing with Janet and Joe on 9/5. Please provide comments back (preferably by office) by COB Tuesday (or earlier!).

Thanks and I hope everyone has a great weekend.

Vera

From: Irving, Bill
To: Jenkins, Jennifer
Sent: 8/29/2013 4:49:30 PM
Subject: RE: Biomass

First slide

Ex. 5 - Deliberative

Second slide

Ex. 5 - Deliberative

From: Jenkins, Jennifer
Sent: Thursday, August 29, 2013 2:03 PM
To: Irving, Bill
Subject: RE: Biomass

See what you think of this

From: Irving, Bill
Sent: Thursday, August 29, 2013 1:40 PM
To: Jenkins, Jennifer
Subject: RE: Biomass

Jen – we shouldn't be putting BAF values in briefings at this stage. We haven't briefed Paul or Sarah on any results and I'm sure they would be uncomfortable with them being presented to Janet.

What we can do is:

Ex. 5 - Deliberative

Ex. 5 - Deliberative

From: Jenkins, Jennifer
Sent: Thursday, August 29, 2013 1:31 PM
To: Irving, Bill
Subject: FW: Biomass

Bill –

See attached. Michael wants us to give some kind of a ballpark BAF number they can plug into this slide for use in the

briefing next week. I understand why they are asking -- **Ex. 5 - Deliberative**
Ex. 5 - Deliberative It would probably be very helpful to have a little more information to use in the decision making process.

Ex. 5 - Deliberative

I will do some preliminary filling-in and send you the next draft, but I won't send it to Michael until we have a chance to discuss.

Thanks
Jen

From: Brooks, MichaelS
Sent: Wednesday, August 28, 2013 2:56 PM
To: Jenkins, Jennifer; Sherry, Christopher; Ohrel, Sara; Grogan-McCulloch, Lisa
Subject: Biomass

Anna would like us to provided some type of indicator on this slide. Something that numerically express the impacts (or benefits) from using these different feedstocks.

For instance -- **Ex. 5 - Deliberative**
Ex. 5 - Deliberative

Is this something you can do for me?

From: Jenkins, Jennifer
To: Irving, Bill; Kocchi, Suzanne
Sent: 8/12/2013 11:11:11 AM
Subject: FW: Biomass Workplan for GHG WP 8-5-13
Attachments: Biomass Workplan for GHG WP 8-5-13 jcj.docx

FYI

Michael is planning to brief Anna tomorrow on this, I think – the workplan so far still lays out the three options for PSD:

Ex. 5 - Deliberative

Michael is leaning toward

Ex. 5 - Deliberative

Ex. 5 - Deliberative

From: Jenkins, Jennifer
Sent: Monday, August 12, 2013 11:06 AM
To: Brooks, MichaelS; Jordan, Scott; Ohrel, Sara; Sherry, Christopher; Mangino, Joseph; Grogan-McCulloch, Lisa
Subject: RE: Biomass Workplan for GHG WP 8-5-13

Michael –

Here are some additional comments on the workplan: these are edits based on Thursday's call. Let me know if it would be helpful to discuss...

cheers
Jen

From: Brooks, MichaelS
Sent: Wednesday, August 07, 2013 2:52 PM
To: Jenkins, Jennifer; Jordan, Scott; Ohrel, Sara; Sherry, Christopher; Mangino, Joseph; Grogan-McCulloch, Lisa
Subject: RE: Biomass Workplan for GHG WP 8-5-13

Thanks, looks good.

Cheers,

Michael S. Brooks

From: Jenkins, Jennifer
Sent: Wednesday, August 07, 2013 2:45 PM
To: Brooks, MichaelS; Jordan, Scott; Ohrel, Sara; Sherry, Christopher; Mangino, Joseph; Grogan-McCulloch, Lisa
Subject: RE: Biomass Workplan for GHG WP 8-5-13

Thanks Michael –

Just a couple of comments, and especially some updates to the OAP piece of the schedule.

Thanks!
Jen

From: Brooks, MichaelS
Sent: Wednesday, August 07, 2013 1:15 PM
To: Jordan, Scott; Jenkins, Jennifer; Ohrel, Sara; Sherry, Christopher; Mangino, Joseph; Grogan-McCulloch, Lisa
Subject: Biomass Workplan for GHG WP 8-5-13

Here is the workplan for your review – let me know if you have any comments, edits, or questions.

Cheers,

Michael S. Brooks
919.541.3539

From: Epanchin, Pete
To: Ohrel, Sara; Jenkins, Jennifer; Irving, Bill
Sent: 7/30/2013 10:10:11 AM
Subject: RE: Tuesday July 30 meeting with SAF

Thanks, Sara. I will go to. Probably start walking there after the all hands meeting, around 12:30. Want to meet in the lobby & walk down there together?

Pete Epanchin, Ph.D.
AAAS Science & Technology Policy Fellow
US Environmental Protection Agency
Office of Air & Radiation
Office of Atmospheric Programs
Climate Change Division
Climate Policy Branch
202-343-9598

From: Ohrel, Sara
Sent: Tuesday, July 30, 2013 10:08 AM
To: Epanchin, Pete; Jenkins, Jennifer; Irving, Bill
Subject: RE: Tuesday July 30 meeting with SAF

H Pete,
I am planning on going down to the Bill J. Joe G scheduled the meeting but who knows if he will be there.

From: Epanchin, Pete
Sent: Tuesday, July 30, 2013 9:52 AM
To: Jenkins, Jennifer; Irving, Bill; Ohrel, Sara
Subject: RE: Tuesday July 30 meeting with SAF

Who is going to this meeting? I was hoping to just call in to it rather than make the trek to ARN. Is anyone planning on physically being there? Or are they meeting with Joe G or another manager from the front office?

Thanks,
Pete

Pete Epanchin, Ph.D.
AAAS Science & Technology Policy Fellow
US Environmental Protection Agency
Office of Air & Radiation
Office of Atmospheric Programs
Climate Change Division
Climate Policy Branch
202-343-9598

From: Jenkins, Jennifer
Sent: Tuesday, July 30, 2013 6:56 AM
To: Irving, Bill; Ohrel, Sara; Epanchin, Pete
Subject: Fw: Tuesday July 30 meeting with SAF

Hmmm... Here is Reid's response. I won't be able to join you, but please pick up an extra copy of the slides! I look forward to hearing about what they have to say.

From: Miner, Reid <RMiner@NCASI.org>
Sent: Tuesday, July 30, 2013 6:45:56 AM

To: Jenkins, Jennifer
Subject: RE: Tuesday July 30 meeting with SAF

Hi Jen
I have not been able to get permission from SAF for an early distribution of the manuscript we have submitted to Science. I expect to be able to share the slides with you after the meeting today, although it may only be in hard copy. The presentation deals with a number of topics that suggest that the methods often used to estimate net carbon impacts associated with using forest biomass for energy miss some important factors that tend to mitigate those fluxes.
Sorry I can't provide more at this point.
Reid

Reid Miner, Vice President-Sustainable Manufacturing
NCASI
P.O.Box 13318
Research Triangle Park, NC 27709
Phone +1 (919) 941-6407
Mobile +1 (919) 600-1022
Fax +1 (919) 941-6401
Email: RMiner@ncasi.org

This message is from NCASI located at the address above. To be removed from NCASI mailing lists, contact publications@ncasi.org

From: Jenkins, Jennifer [<mailto:Jenkins.Jennifer@epa.gov>]
Sent: Friday, July 26, 2013 11:05 AM
To: Miner, Reid
Subject: Tuesday July 30 meeting with SAF

Reid –

I see that we have a meeting scheduled for next Tuesday afternoon with you and SAF. I'm not sure I can make it to that meeting due to a prior obligation. I wondered if you could tell us a little bit ahead of time about what you plan to discuss/ present?

Thanks!
Jen

Jennifer C. Jenkins, Ph.D.
Climate Policy Branch
Climate Change Division, Office of Atmospheric Programs
US Environmental Protection Agency
202-343-9361
jenkins.jennifer@epa.gov

From: Jenkins, Jennifer
To: Jenkins, Jennifer; Kornylak, Vera S.; Doster, Brian; Jordan, Scott; Brooks, MichaelS; Santiago, Juan; Wheeler, Carrie; Montanez, Jessica; Zenick, Elliott; Ohrel, Sara; Sherry, Christopher; Cole, Jefferson; Kocchi, Suzanne; Irving, Bill; Fawcett, Allen
CC: Swanson, Nicholas; Bradfield, John; Dunkins, Robin; Schrock, Bill; Spence, Kelley; Srivastava, Amit
Sent: 11/15/2013 3:53:39 PM
Subject: Briefing on revised framework for biogenic CO2 accounting
Attachments: briefing on AF2 for OGC OAQPS 12 5 2013.pptx

UPDATE with call-in info and briefing materials:

Call-in: Ex. 6 - Personal Privacy
Code: Ex. 6 - Personal Privacy

All:

It's what you've been waiting for! OAP would like to arrange a time when we can brief you on the contents of the revised Framework for accounting for biogenic CO2 emissions from stationary sources. Let's have this first meeting over the phone/ by video and then see whether it makes sense for us to travel for a face-to-face meeting sometime after the New Year.

I've reserved 1.5 hours for this, so we can really get into the details and discuss the nuances. If we need more time we can schedule another meeting, and if we need less we can always end early.

Briefing materials to follow.

Thanks
Jen

From: Irving, Bill
To: Sherry, Christopher; Ohrel, Sara; Epanchin, Pete
CC: Kocchi, Suzanne; Jenkins, Jennifer
Sent: 7/2/2013 5:09:47 PM
Subject: FW: Bioenergy market study
Attachments: NAFO US_Bioenergy_Markets FINAL 20130626.pdf

FYI

From: Chip Murray [mailto:cmurray@nafoalliance.org]
Sent: Tuesday, July 02, 2013 5:06 PM
To: Jenkins, Jennifer; Goffman, Joseph; Irving, Bill
Cc: Dave Tenny
Subject: Bioenergy market study

Thanks for meeting with us last week. During our discussion, Dave and I mentioned a new study by the Forisk Consulting group regarding demand from bioenergy in the context of current forest products markets. A key finding of this study is that “No viable scenario generates wood demand levels at the regional or national level that affect net forest growth or sustainability.” If you have any questions, please Dave or myself, or better yet, call Amanda or Brooks at Forisk.

Please share with the others on the call. We will be releasing the study next week. Chip

Chip Murray
Vice President for Policy & General Counsel
National Alliance of Forest Owners
(202) 747-0742

www.nafoalliance.org

Update and Context for U.S. Wood Bioenergy Markets

Commissioned by:

National Alliance of Forest Owners
122 C Street, NW, Suite 630
Washington, DC 20001
www.nafoalliance.org

Conducted by:

Forisk Consulting
Athens, GA 30604
www.forisk.com

Principal investigators:

Brooks Mendell, Ph.D.,
bmendell@forisk.com
Amanda Hamsley Lang,
ahlang@forisk.com

Executive Summary

This paper quantifies the current baseline for forest industry wood consumption in the United States in order to provide context for wood bioenergy market developments and research. Specifically, we address the following questions:

- What is the current status of wood demand from bioenergy in the United States and how has it evolved since 2010?
- What is the current status of traditional wood demand from the forest products industry and forest supplies/growth in the U.S.?
- What are reasonable expectations for wood bioenergy growth in the U.S. relative to the forest products industry over the next ten years?

Establishing the current forest industry baseline and specifying what is “doable” and “operable” in regional U.S. bioenergy markets provides a factual basis for evaluating how wood bioenergy markets could affect forest supplies.

Key findings from this research include:

- Analysis and tracking of wood bioenergy projects by technology type and region affirm the slow, stuttered development of wood bioenergy markets in the United States. Two types of projects have led progress in wood bioenergy markets over the past three years. First, industrial combined-heat-and-power (CHP) plants and firms that build industrial CHP facilities and either use the electricity and heat/power produced for their own manufacturing plants or sell it to neighboring facilities. Second, pellet plants targeting both domestic and export markets have made progress.
- Since 2010, total potential wood use from announced and operating projects increased 3% while potential wood use from operationally “viable” projects increased approximately 10%. Based on Forisk analysis, 293 projects representing potential wood use of 75.4 million tons per year by 2023 pass basic viability screening. This estimate includes all woody feedstocks, including pulpwood, logging residues, and mill residuals.
- Consensus exists across public, private and international studies and data sources regarding the size and status of the U.S. forest products industry. Demand for “industrial” roundwood – the logs used at manufacturing facilities – is approximately 500 million tons per year during normal economic conditions.
- Wood bioenergy scenarios developed by the IPCC and applied to models of U.S. forests fail to account for the economic recession and the viable scale of actual and operable wood bioenergy projects.
- Viable wood bioenergy scenarios developed separately by U.S. Forest Service researchers and Forisk find the marginal increase in wood demand for pulpwood and logging residues from viable bioenergy projects compared to the overall forest industry in 2023 could be as much as 9% of the total wood use of the forestry sector or as little as 4%. The vast majority of wood use will still be from the traditional forest products sector. No viable scenario generates wood demand levels at the regional or national level that affect net forest growth or sustainability. While wood bioenergy projects could have no negative impact on forest supplies in the aggregate, local impacts will vary based on individual wood baskets and timber markets.

Acknowledgements: we wish to thank NCASI and researchers at the U.S. Forest Service for their willingness to share and discuss ideas and assumptions related to wood bioenergy markets and forest supply modeling associated with the RPA Assessments.

Introduction

Wood bioenergy markets in the United States continue to perplex interested parties. In particular, questions arise regarding how developing bioenergy markets will affect the use and demand for wood and, in turn, how this demand will affect wood supplies and economics in the overall forest products marketplace. Currently, private forest owners have long-established customers for the trees they grow on their lands: sawmills, pulp mills, OSB facilities and plywood plants. These customers expand and decrease their wood use over time depending on economic conditions and demand for their manufactured products.

Over the past few years, wood bioenergy projects garnered headlines, benefited from targeted legislation and financing programs, and produced dozens of failed and successful plants across the U.S. This provides data and information to evaluate the status of wood bioenergy demand relative to the established forest industry. It also frames the context for considering the implications from bioenergy projects related to wood raw material prices, forest management strategies and the long-term sustainability of U.S. forests.

This paper quantifies the current baseline for forest industry wood consumption in the U.S. in order to provide context for wood bioenergy market developments and research. When tracking wood demand and timber markets, we look not only to the past and to the future for guidance, but also to the side – peripherally – to gauge performance across wood-using markets and sectors. Specifically, we address the following questions:

- What is the current status of wood demand from bioenergy in the United States and how has it evolved over the past five years?
- What is the current status of traditional wood demand from the forest products industry and forest supplies/growth in the U.S.?
- What are reasonable expectations for wood bioenergy growth in the U.S. relative to the forest products industry over the next ten years?

Ultimately, establishing the current forest industry baseline and specifying what is “doable” and “operable” in regional U.S. bioenergy markets provides a factual basis for evaluating how wood bioenergy markets could affect forest supplies. This also allows us to evaluate recent research and scenarios applied to forward thinking analysis related to wood bioenergy markets.

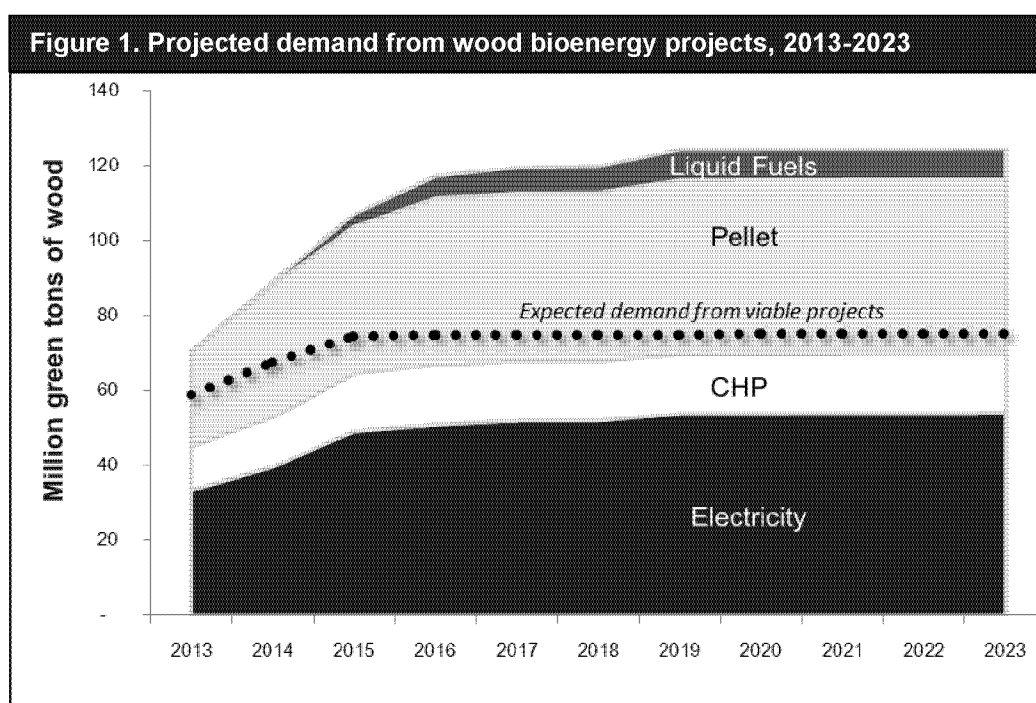
Wood Bioenergy Market Development

In 1972, the Club of Rome commissioned *The Limits to Growth*, a book which explored the interaction between exponential growth and limited resources. The book concluded that the world would reach its limit within 100 years of publication, resulting in a massive decline of population and industrial capability. While criticized at the time, key elements of the research – such as those associated with population growth and CO₂ levels – held up, reinforcing historic relationships between resources and growing populations. However, the research understated the role played by prices and markets in allocating resources.

Lessons from this research apply when evaluating the development of wood bioenergy markets. While market forces and policy decisions struggle to coexist, the actual growth of bioenergy relative to available resources can be understood. Wood bioenergy projects must successfully navigate logistic challenges and access to wood raw materials within the context of existing forest industry markets. To a critical extent, assessing bioenergy markets is an exercise of measuring size and performance relative to the existing forest industry.

Analysis of projects “on the ground” frames our understanding of what is possible and viable for growing wood demand from bioenergy. Forisk uses a two-part screening methodology to estimate project viability by technology and by status. If the technology is viable today (such as wood pelletizing technology or wood to electricity) then the project passes the technology screen. For example, cellulosic ethanol technologies do not currently pass the technology screen. The status screen evaluates projects based on where they are in the development process. If a project has two or more necessary permits, contracts, or financing commitments, then it passes the status screen. “Likely” projects are those that pass both screens. (See Appendix A for additional details on the project screening methodology).

Since 2010, multiple wood bioenergy projects in the United States have opened, closed or advanced towards operational viability. However, the implications on potential wood use were modest. Total potential wood use from announced and operating projects increased 3% while potential wood use from operationally “viable” projects increased approximately 10%. As of April 2013, *Wood Bioenergy US* counts 456 announced and operating wood bioenergy projects in the U.S. with total, potential wood use of 125.0 million tons per year by 2023 from all feedstocks, including forest materials and mill residuals (Figure 1). Based on Forisk analysis, 293 projects representing potential wood use of 75.4 million tons per year pass basic viability screening.



Source: Forisk Consulting

Note: largely excludes cogeneration projects at forest products facilities.

Analysis and tracking of wood bioenergy projects by technology type and region affirm the slow, stuttered development of wood bioenergy markets in the United States. These markets depend on legislative mandates or remain uncompetitive with traditional forest industry manufacturers or more economic energy sources such as natural gas. Two types of projects have led progress in wood bioenergy markets over the past three years. First, industrial combined-heat-and-power (CHP) plants and firms that build industrial CHP facilities and either use the electricity and heat/power produced for their own manufacturing plants or sell it to neighboring facilities. This

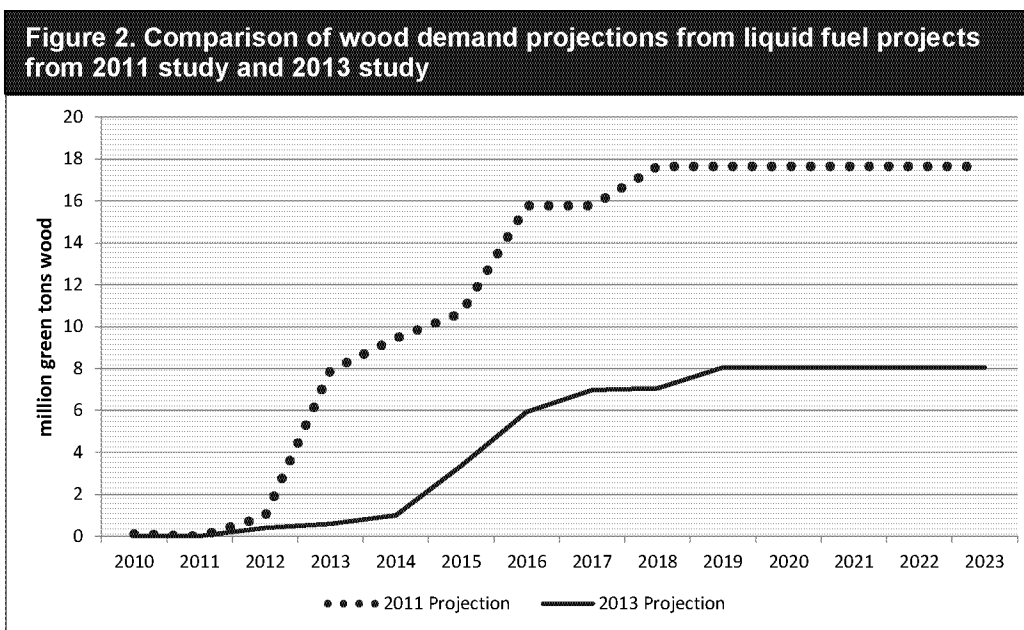
includes some government-sponsored completed CHP projects, such as Oak Ridge National Laboratory and the Savannah River Site. Second, pellet plants targeting both the smaller domestic and growing export markets have made progress. Export pellet plants are selling to European utilities to help them meet renewable energy requirements. In addition, there are select independent power producers who continue to build electricity plants.

A review of the primary wood bioenergy technologies and project types reinforces these themes.

Wood-Based Liquid Fuels

Research by private and public organizations emphasizes the problematic development of the wood biofuels sector. In 2011, Forisk and the Schiamburg Group evaluated 36 publicly-known wood-using biofuels projects in the U.S. concluding that they would take eight to 11 years longer to develop than estimated by the projects themselves while singling out projects with drop-in fuels and specific technology types as having investment potential for investors. A review of the 36 projects from the 2011 study re-affirms that biofuels from wood is not a mainstream reality (Forisk 2012). As of April 2013, 13 of the original 36 projects have been cancelled and 12 remain in the planning or construction stages. Four have been shut down. In total, 27 of the 36 projects (75%) have been cancelled or have failed to advance. Unfavorable project economics and insufficient financing are the primary reasons for the cancellations and shut-downs.

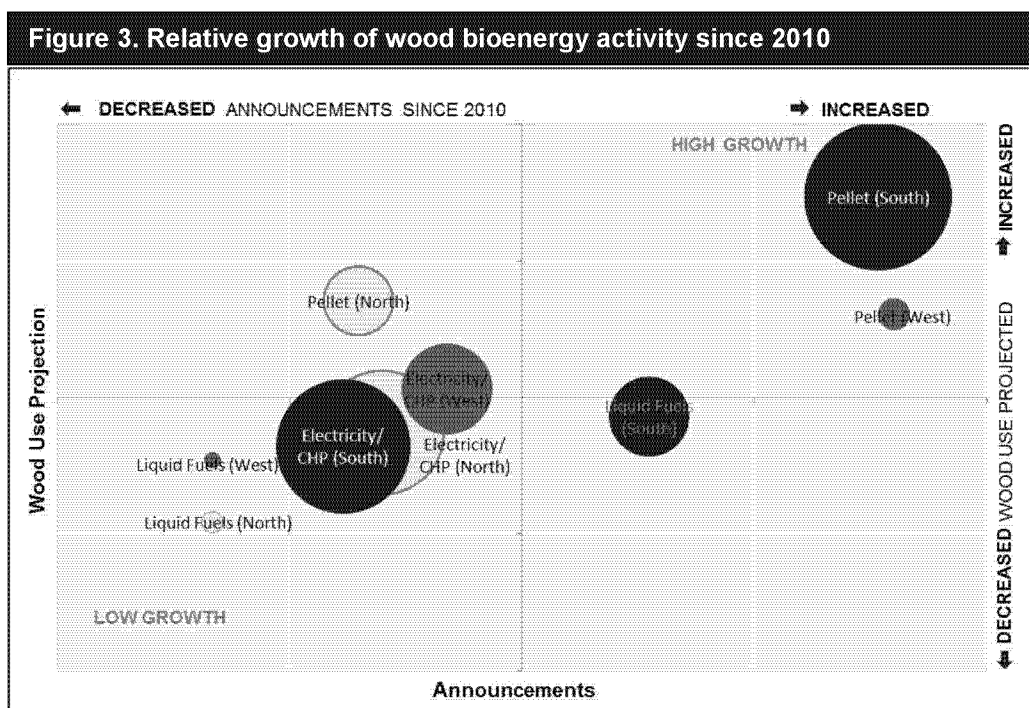
Newly announced wood biofuel projects have become increasingly less ambitious and less relevant to forest industry firms and timberland investors. Analysis comparing projects in 2013 to those from 2011 find that current projects use less wood and scale at smaller production levels. Meanwhile, the traditional forest products industry is reopening closed plants and building new capacity in response to increasing housing demand. Analysis of potential wood use highlights the minimal relevance of the biofuels projects to timberland investors in the U.S. today and over the next ten years (Figure 2). Even the U.S. Forest Service set aside the wood biofuels sector in its December 2012 projections for the U.S. forest products industry (Ince and Nepal 2012). They note, “The scale of such technologies remains highly uncertain, so we do not include projected timber demands for such technologies.”



Source: Forisk Consulting

Wood Pellets

The wood pellet sector highlights the localized and technology-dependent nature of wood bioenergy market growth and potential. Wood pellet project development in the South leads the U.S. across nine regional wood bioenergy subsectors: pellets, liquid fuels and electricity/CHP in the North, South and Pacific Northwest (Figure 3). Of current pellet project announcements, 89% of the total production by 2023 would be exported to European markets. However, the ability of U.S. firms and exporters to successfully produce wood pellets is limited by critical factors associated with port access and the economics of pulpwood markets. Location-based issues and raw material prices and availability drive due diligence efforts to a short list of logistically attractive wood basins that include varying levels of direct, unyielding competition for residual chips and pulpwood roundwood. These factors limit the potential growth of wood pellet producers within the United States.



Source: Forisk Consulting

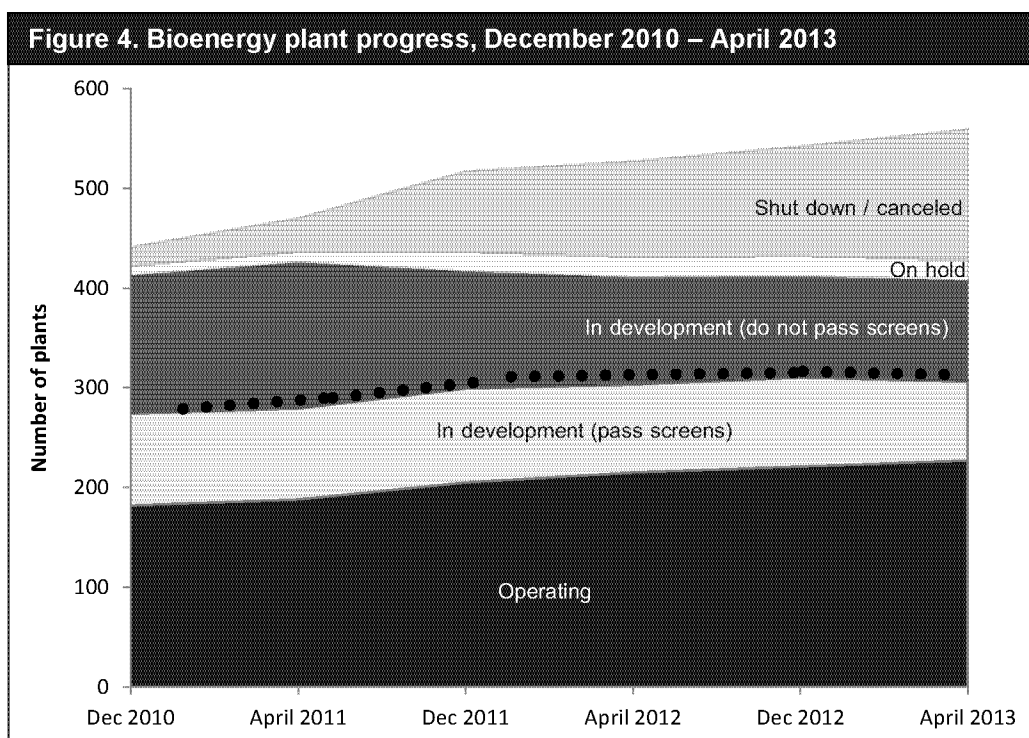
Three factors help explain why pellet projects in the South lead the U.S. First, wood pellet plants rely on known, proven technologies. This facilitates the financing and development of new projects. Second, pellet projects require lower levels of capital investment relative to liquid fuel and large scale electricity projects. Pellet projects require \$150 million or less while the others require hundreds of millions of dollars. Third, project developers and investors are responding to actual demand from actual customers (in Europe). For the pellet projects announced as of April 2013, 55% (32 of 58) focus on the export markets. For the South, export oriented projects account for 93% of the total.

Wood Electricity

Large scale wood-to-electricity in the United States, shaped by monumental energy policies, began in the 1970s (Mendell and Lang 2012). However, as of May 2013, the United States does not have a federal mandate for renewable electricity, or renewable energy standard (RES). The lack of a federal RES slowed the development of stand-alone wood-bioelectricity plants.

While public policy appears critical in advancing wood bioenergy, market factors related to financing and project economics play instrumental roles in stalling wood electricity. Failure to secure off-take (PPA) agreements, the inability to obtain financing, and plentiful and cheap natural gas supplies have reduced expectations associated with wood-based biopower in the United States over the next ten years. Of the 151 projects on hold, shut down or canceled as of April 2013, 84 (56%) are wood-to-electricity or CHP projects.

Figure 4 summarizes the overall progress of wood bioenergy projects in the U.S. Projects have been put on hold, shut down, or canceled for a variety of reasons, including financing, the relatively high costs of woody feedstock compared with low natural gas prices, regulatory uncertainty, and difficulties obtaining economically sensible PPAs. In limited instances, local opposition to bioenergy projects has also slowed bioenergy market development.



Source: Forisk Consulting

Recent events related to the preference for natural gas support a story consistent with the historical evolution of U.S. energy markets. *Wood for Bioenergy* (Mendell and Lang 2012) details the central role of wood as an energy feedstock in the 1800s. However, markets shifted as cheap and plentiful coal replaced wood, establishing and repeating a trend of cheap energy quickly substituting for costly energy.

Looking Forward: Context for Potential Wood Bioenergy Market Growth

The economics of pulpwood markets are increasingly important for wood bioenergy projects. Current pulpwood users already buy nearly 140 million tons of pulpwood and in-woods chips in the South alone. Local wood supply and demand dynamics dictate market responses to new

entrants. Aggregate pulpwood and chip demand in the U.S. comes from three categories of end uses¹:

- 1) **Paper and paperboard**, which includes all paper, containerboard and cardboard types produced in the U.S.
- 2) **Oriented strand board (OSB)**, a type of engineered structural panel made from low-value wood raw material; strands, or long chips, of wood are glued together in a specific orientation to form panels. OSB is used in construction and directly competes with plywood.
- 3) **Wood use for bioenergy**, most woody biomass facilities intend to use the by-products of forestry operations for feedstock; however, some will require pulpwood-sized roundwood or clean pulp chips.

Multiple firms and government agencies develop projections of how wood demand from biomass firms will grow in the future. For example, the U.S. Forest Service released the 2010 RPA Assessment (USDA Forest Service 2012). The 1974 Forest and Rangeland Renewable Resources Planning Act required that the Forest Service prepare information for the American public regarding the future of America's forests and how they would meet resource demands. The RPA Assessment includes information on the current status and projected future state of forests in the U.S. on a 10-year cycle, as well as projections of wildlife and fish, water, outdoor recreation, and other natural resource issues.

As part of its projections for forests and forest products, the RPA Assessment tests multiple scenarios regarding wood bioenergy development. The scenarios, based on Intergovernmental Panel on Climate Change (IPCC) scenarios of global energy use, start in year 2020 and go through 2060. The use of IPCC scenarios provided a framework for working in parallel with other modeling efforts conducted in the scientific community at the time of the RPA research from 2005 through 2010. It also provided a broad range and breadth of possible outcomes without taking a position on likelihood. In addition to the IPCC scenarios, the RPA includes a historical fuelwood (HFW) scenario that is based on the relationship between fuelwood use and GDP in each country.

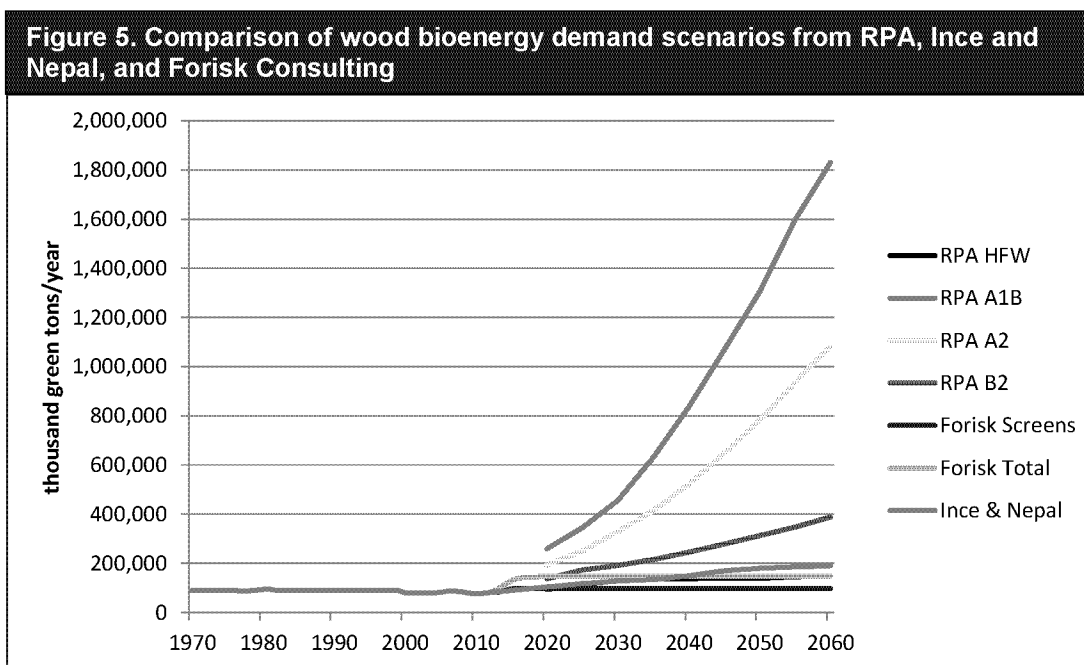
During and following research associated with the RPA, the U.S. economy declined as did wood use associated with forest products manufacturing. To address recent market events and other baseline assumptions in the RPA, U.S. Forest Service researchers Peter Ince and Prakash Nepal (2012) published research to address three issues with the 2010 RPA Assessment: 1) to account for the economic recession in the projections; 2) to account for changes in the bioenergy outlook and low natural gas prices; and 3) to consider currency exchange rates in their projections. Ince and Nepal follow the same methodology as the HFW scenario in the RPA assessment, with updated underlying assumptions, including housing starts.

Forisk Consulting projects wood use from bioenergy projects using a bottom-up approach in its *Wood Bioenergy US* (WBUS) publication. WBUS tracks over 450 announced and operating wood-using bioenergy projects. Forisk projects the estimated wood use of each of these projects and sums the total wood use by each project until 2023. Forisk does not project bioenergy demand growth beyond the next 10 years.

Major differences exist in the assumed levels of wood demand for the IPCC scenarios and the work by Ince and Nepal and Forisk Consulting. As a result, the highest demand scenario from

¹ Another important forest industry sector that produces composite panels such as MDF is not included here because it relies primarily on manufacturing residuals for its raw material. This paper focuses on pulpwood and in-woods chips delivered directly from the forest.

the RPA projects significant growth of wood bioenergy in the U.S.; wood demand for bioenergy climbs to levels that are 5 times higher than all other wood uses by 2060. The Ince and Nepal projection and HFW scenario from the RPA fall closer in line to independently developed projections by Forisk in *Wood Bioenergy US* than the IPCC scenarios (Figure 5).



Sources: USDA Forest Service, 2012; Ince and Nepal, 2012; Forisk Consulting, 2013

Note: Forisk projections include operating cogeneration facilities at forest products plants. All projections exclude "fuelwood" estimates and include mill residues, pulpwood, and logging residues.

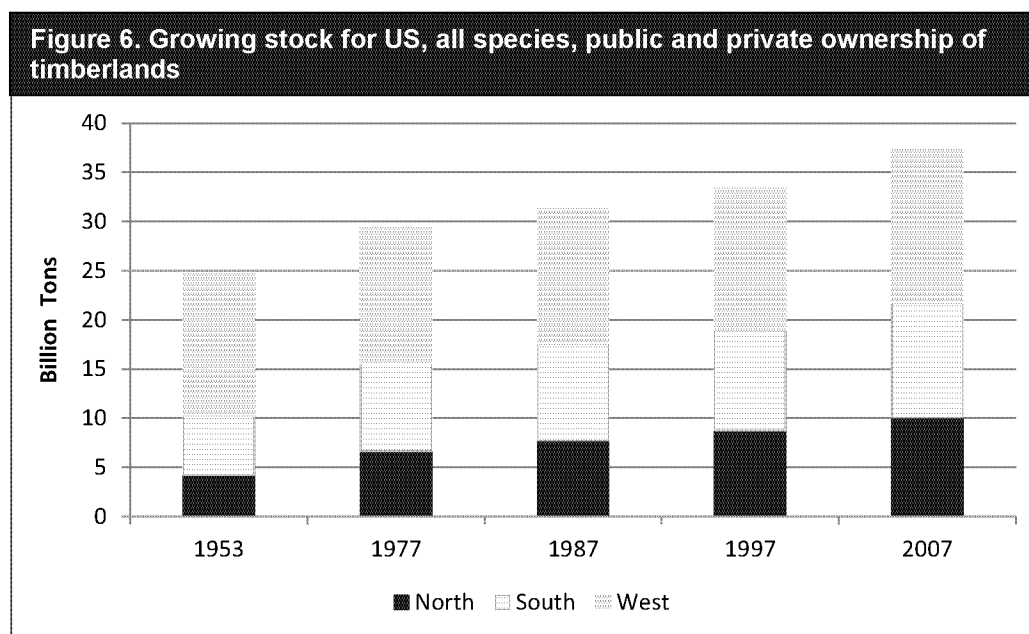
Analysis of the underlying assumptions highlights the disconnect between broad-based, demand-driven scenarios that assume aggressive growth in wood demand from bioenergy in the United States and assessments of what may be operable and "doable" on the ground. The IPCC-based scenarios in the RPA are not realistic in that they do not account for operational or market constraints. Notwithstanding assumed wood demand for bioenergy, the industry will likely not have the resources, technologies or competitive economics to deliver energy to the U.S. market at the assumed levels.

Bioenergy projections that account for historical relationships (HFW in the RPA and Ince and Nepal) more closely match the research by Forisk that relies on actual announcements by biomass firms. The reality of market-based scenarios further underscores the recent emergence of cheap and plentiful natural gas which has replaced planned wood bioenergy projects and capacity. In short, bioenergy projects participate in a competitive market for capital and wood raw materials, and the present outlook suggests that domestic growth in new sources of bioenergy from wood will be modest.

Forest Products Sector Demand

Analysis of forest inventories in the United States highlights how forest growth continues to outpace forest removals. Analysis of U.S. Forest Service inventory data by region confirms a continued accumulation of forest volume across public and private forest ownerships in all U.S. regions. While the specific supply and demand dynamics vary for specific local markets and

during specific local natural catastrophes, the aggregate assessment of forest volume trends remains unchallenged: forest inventories in the U.S. today exceed those of ten, twenty and fifty years ago (Figure 6).

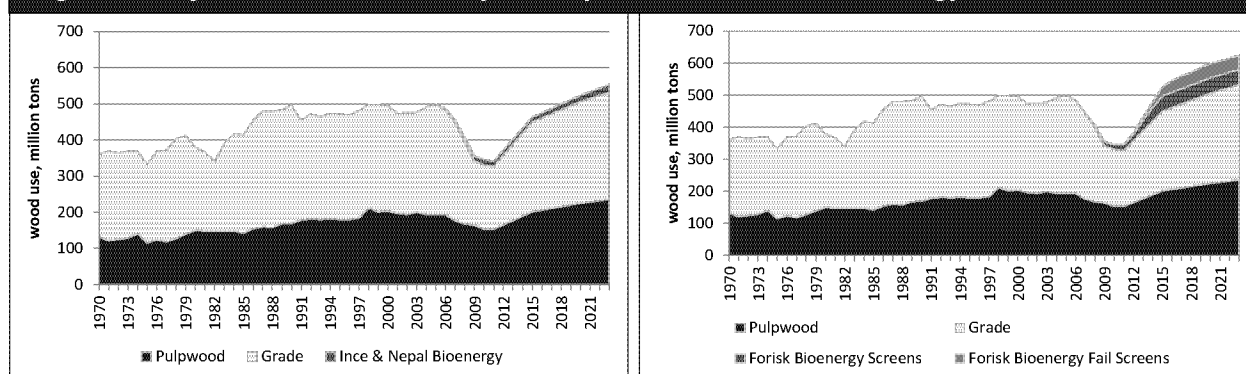


Source: US Forest Service (RPA Assessment) Smith et al. 2009

Total wood demand in the United States has declined in recent years. According to the United Nations, demand for “industrial” roundwood – the logs used at manufacturing facilities – declined 33% from 2005 to 2011, from 508 million tons to 341 million tons per year. According to the U.S. Forest Service, demand for roundwood – as measured by forest removals – declined 34% from 2005 to 2011, from 491 million tons to 326 million tons per year. And according to forest industry analysis and forecast work conducted by Forisk, demand for wood declined 31% from 2005 to 2012, from 500 million tons to 347 million tons per year.

Each of these sources indicates rising demand for wood over the past two years as markets continue to strengthen. As of year-end 2012, for example, U.S. Forest Service and Forisk analysis indicate forest industry demand for wood increased between 7 and 9% since 2011. Overall trends associated with (1) U.S. lumber consumption increasingly sourced by U.S. manufacturers at the expense of Canadian producers and (2) strong export markets for specialized pulp products and softwood lumber support projections of wood demand for the U.S. forest industry returning to 500 million tons per year by 2020. In addition, consensus exists across databases and studies from private researchers, the U.S. Forest Service, and public international databases that the supply of industrial roundwood in the United States exceeds this level of demand from manufacturing facilities and will likely continue to do so in the future.

The Ince and Nepal (2012) and Forisk scenarios show the marginal increase in wood demand for forest materials (i.e. pulpwood and logging residues) from bioenergy projects compared to the overall forest industry (Figure 7). In 2023 pulpwood and logging residue wood use from viable bioenergy applications could be as much as 9% of the total wood use of the forestry sector or as little as 4%. The vast majority of wood use will still be from the traditional forest products sector.

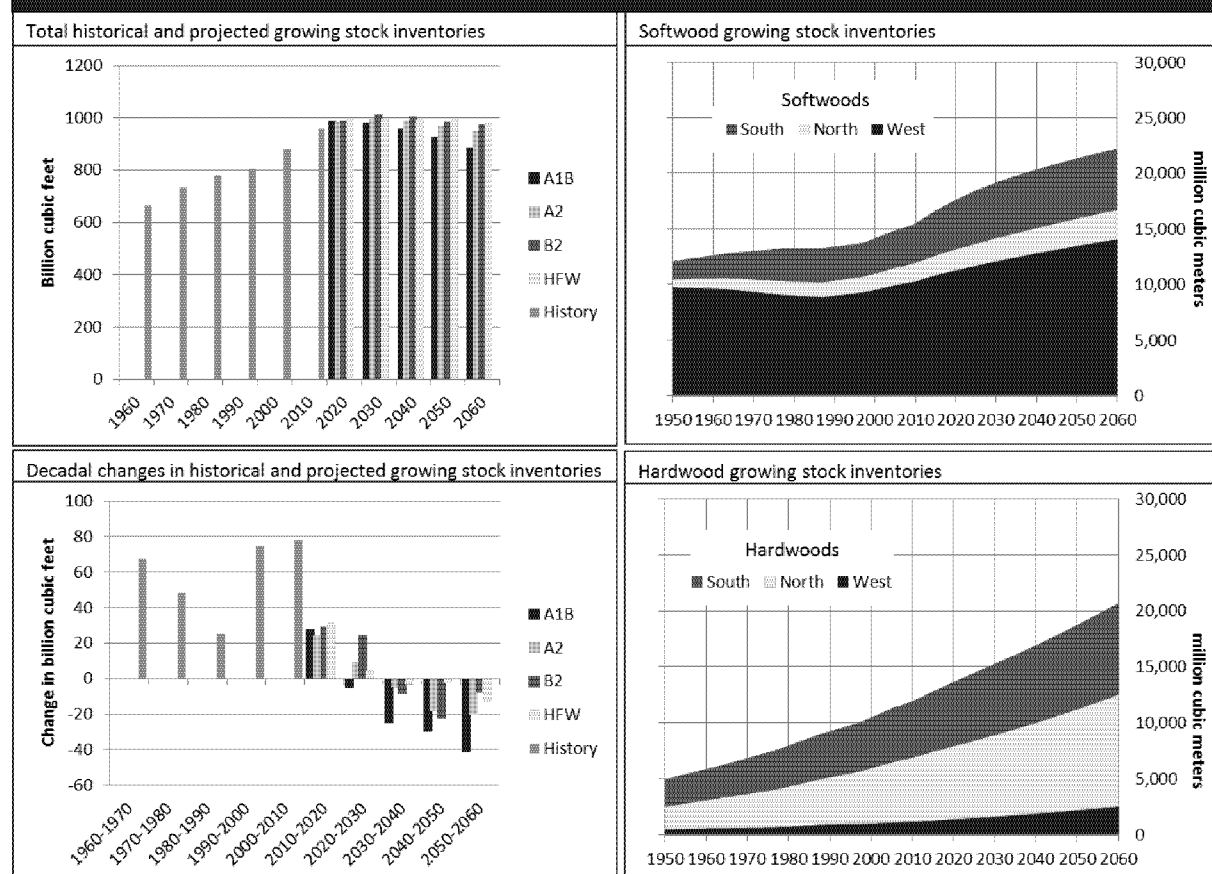
Figure 7. Projected wood demand by forest products and wood bioenergy sectors in U.S.

Source: Ince and Nepal, 2012; Forisk Consulting

Note: bioenergy projections include pulpwood and logging residues only; exclude mill residues and fuelwood.

Although wood demand from the forest products and bioenergy sectors is projected to increase, forest supplies are also projected to increase in aggregate (Figure 8). Future forest supplies from Ince and Nepal (2012) show increasing inventories; in contrast, the RPA assessment projects decreasing forest inventories. The baseline outlook for housing and demand for wood was lower in Ince and Nepal's model than in the RPA, and Ince and Nepal accounted for decreased demand for wood during the recession, while the RPA assessment did not. Also, Ince and Nepal projected much lower demand for wood for energy applications than most RPA scenarios (except HFW). Also, the two research assessments used different modeling approaches for forest supplies. The projections by Ince and Nepal account for recent events that affect wood use and include a more realistic wood bioenergy demand scenario than the RPA. Of the two supply projections, we view the Ince and Nepal projection as the most likely.

Forest supply projections by the U.S. Forest Service show that wood bioenergy projects pose no negative impact at a regional level. Bioenergy projects could have impacts at local levels depending on a variety of factors, including landowner dynamics, proximity to existing manufacturing facilities, prices, disturbance and other variables. Such variables are typically considered during project development and help determine the economic viability of a project.

Figure 8. Projected forest supplies from RPA Assessment (left) and Ince and Nepal 2012 (right).

Sources: USDA Forest Service, 2012; Ince and Nepal, 2012

Conclusions

This paper quantifies the current baseline for forest industry wood consumption in the U.S. to provide context for wood bioenergy market developments and research. Specifically, it addresses questions of wood demand from bioenergy, wood demand from the forest products industry, and reasonable expectations for wood bioenergy growth in the U.S. relative to the forest products industry over the next ten years. Establishing the current forest industry baseline and quantifying what is “doable” and “operable” in regional U.S. bioenergy markets provides a factual basis for evaluating how wood bioenergy markets could affect forest supplies.

Key findings from this research include:

- Analysis and tracking of wood bioenergy projects by technology type and region affirm the slow, stuttered development of wood bioenergy markets in the United States.
- Since 2010, total potential wood use from announced and operating projects increased 3% while potential wood use from operationally “viable” projects increased approximately 10%. Based on Forisk analysis, 293 projects representing potential wood use of 75.4 million tons per year by 2023 pass basic viability screening. This estimate includes all woody feedstocks, including pulpwood, logging residues, and mill residuals.

- Consensus exists across public, private and international studies and data sources regarding the size and status of the U.S. forest products industry. Demand for “industrial” roundwood – the logs used at manufacturing facilities – is approximately 500 million tons per year during normal economic conditions.
- Wood bioenergy scenarios developed by the IPCC and applied to models of U.S. forests have major flaws with respect to failures to account for the economic recession and the viable scale of actual and operable wood bioenergy projects in the United States.
- Viable wood bioenergy scenarios developed separately by U.S. Forest Service researchers and Forisk find the marginal increase in wood demand for pulpwood and logging residues from viable bioenergy projects compared to the overall forest industry in 2023 could be as much as 9% of the total wood use of the forestry sector or as little as 4%. The vast majority of wood use will still be from the traditional forest products sector.

Assumptions regarding market viability and what is operationally “doable” remain critically important when making projections of wood bioenergy impacts in the United States. This research reaffirms the importance of considering realistic scenarios that have basis in actual market transactional data and account for market responses. Wood bioenergy projects will likely have no negative impact on forest supplies in the aggregate, while more specific impacts will likely occur locally in individual wood baskets and timber markets.

Literature Cited

Forisk Consulting, 2013. *Wood Bioenergy US*. Volume 5, Issue 2.

Ince, Peter J.; Nepal, Prakash. 2012. Effects on U.S. Timber Outlook of Recent Economic Recession, Collapse in Housing Construction, and Wood Energy Trends. USDA Forest Service, Forest Products Laboratory, General Technical Report, FPL-GTR-219, 2012: 21 p.

Lang, A.H. and B.C. Mendell. 2011. Sustainable wood procurement: what the literature tells us, *Journal of Forestry*, 110(3): 157-163.

Mendell, B.C. and A.H. Lang. 2012. *Wood for Bioenergy: Forests as a Resource for Biomass and Biofuels*. Forest History Society, 77 pages.

Mendell, B., A.H. Lang and B. Schiamberg. 2011. Transportation fuels from wood: investment and market implications of current projects and technologies. Forisk Consulting and the Schiamberg Group. Bogart, GA. 85 pages.

Mendell, B. and A.H. Lang. 2010. A practical guide for tracking wood-using bioenergy markets. *National Alliance of Forest Owners White Paper*. April: 1-10. Available at: <http://nafoalliance.org/wp-content/uploads/Forisk-A-Practical-Guide-for-Tracking-Wood-Using-Bioenergy.pdf>

Smith, W. Brad, tech. coord.; Miles, Patrick D., data coord.; Perry, Charles H., map coord.; Pugh, Scott A., Data CD coord. 2009. *Forest Resources of the United States, 2007*. Gen. Tech. Rep. WO-78. Washington, DC: U.S. Department of Agriculture, Forest Service, Washington Office.

USDA Forest Service. 2012. *Future of America's Forest and Rangelands: Forest Service 2010 Resources Planning Act Assessment*. Gen. Tech. Rep. WO-87. Washington, DC. 198 p.

Wear, David N. 2011. *Forecasts of county-level land uses under three future scenarios: a technical document supporting the Forest Service 2010 RPA Assessment*. Gen. Tech. Rep. SRS-141. Asheville, NC: U.S. Department of Agriculture Forest Service, Southern Research Station. 41 p.

Appendix A. Screening Operating and Announced Wood Bioenergy Projects

This appendix summarizes the methodology detailed in a white paper commissioned by NAFO in 2010. The complete paper is available at: <http://nafoalliance.org/wp-content/uploads/Forisk-A-Practical-Guide-for-Tracking-Wood-Using-Bioenergy.pdf>

Forisk developed a wood bioenergy market screening methodology to assess project viability, and documented this method in a white paper published by the National Alliance of Forest Owners (Mendell and Lang 2010). The basic methodology for the screen relies on two criteria for wood-consuming projects:

- **Technology:** projects that employ currently viable technology pass the technology screen. These include pelletizing technology and wood-to-electricity projects.
- **Status:** projects that are operational, under construction, or received or secured two or more necessary elements for advancing towards operations pass the status screen.

The following checklist can be applied to replicate Forisk's project-by-project screening to assess if projects are likely to succeed:

Step 1: Technology Screen

Is the project a wood to electricity project, a pellet project, or a project that uses another technology that is commercially viable today?

If YES, then go to Step 2: Status Screen. If NO, stop – project fails the screen.

Step 2: Status Screen

Is the project operating?

If YES, then the project passes the screen. If NO, go to question 2a.

2a. Is the project under construction?

If YES, then the project passes the screen. If NO, go to question 2b.

2b. Does the project have two or more of the following?

- ☐ Secured site
- ☐ Financing
- ☐ Air permit
- ☐ Engineering Procurement and Construction (EPC) contract
- ☐ Power Purchase agreement or off-take agreement
- ☐ Public Service Commission approval
- ☐ Interconnection agreement
- ☐ Wood supply agreement

If YES, the project passes the screen and demonstrates momentum towards initiating construction. If NO, then the project fails the screen and is not considered likely to succeed at this time given publicly-available information.

From: Ohrel, Sara
To: Irving, Bill
CC: Jenkins, Jennifer; Sherry, Christopher; Epanchin, Pete
Sent: 5/17/2013 5:43:17 PM
Subject: Draft of the Accounting Framework main document
Attachments: AF2 main body_5.17.2013_clean with comments.docx; AF2 main body_5.17.2013_with tracked changes_comments.docx

Hi Bill,

Attached you will find two versions of the current draft of the Accounting Framework main document: one with tracked changes and comments and another with no tracked changes but with comments.

I will also send a version to Allen to see if he has any specific comments on the baseline section (revised per his comments).

Thanks for conducting this review, we look forward to your thoughts next week – happy reading!

Sara

Sara Bushey Ohrel
Climate Economics Branch
Climate Change Division
U.S. Environmental Protection Agency
Phone: (202) 343-9712
Cell: (202) 341-6748

From: Jenkins, Jennifer
To: Irving, Bill
Sent: 5/14/2013 10:30:33 AM
Subject: FW: next draft of AF2
Attachments: AF2 main body clean with_comments_5.8.2013 - aaf.docx

Bill –

Just FYI, the version of the main body that went to you yesterday had been edited by Suzie ->Chris ->Pete, so it did not include these comments that Allen sent. Sara is editing the baselines section (in Part 2) in particular today to be responsive to the comments from Allen.

thanks
Jen

From: Fawcett, Allen
Sent: Thursday, May 09, 2013 3:51 PM
To: Irving, Bill; Jenkins, Jennifer; Kocchi, Suzanne
Cc: Epanchin, Pete; Ohrel, Sara; Sherry, Christopher
Subject: RE: next draft of AF2

Here are my comments on the baseline sections. Thanks for all the edits to the last draft, this is much improved.

Allen

From: Irving, Bill
Sent: Thursday, May 09, 2013 10:59 AM
To: Jenkins, Jennifer; Kocchi, Suzanne; Fawcett, Allen
Cc: Epanchin, Pete; Ohrel, Sara; Sherry, Christopher
Subject: RE: next draft of AF2

All – thanks. Suzie is reviewing the entire front section first, and then I will work off of her edited version. In parallel, Allen will be reviewing baseline text in the front section as well as the relevant appendices.

Bill

From: Jenkins, Jennifer
Sent: Wednesday, May 08, 2013 9:47 PM
To: Kocchi, Suzanne; Irving, Bill; Fawcett, Allen
Cc: Epanchin, Pete; Ohrel, Sara; Sherry, Christopher
Subject: next draft of AF2

Bill, Allen, and Suzie:

Attached please find three versions of the next draft AF2, for your review. I am attaching all three so that you can decide which version you'd like to read this time around -- the tracked version is messy, but might be helpful to see the edits we made in response to your previous review. The "clean with comments" version has the line edits accepted, but retains the comments, and the "clean" version has neither line edits nor comments.

A couple of notes:

- Team Biomass is reviewing the Executive Summary now: we can send that to you on Monday so that you can take a look before it goes into Paul's version.

- Bill had suggested

Ex. 5 - Deliberative

Ex. 5 - Deliberative

that section seems to flow just fine now. Let us know what you think – we can edit that section more if needed.

A couple of placeholders here for additional text: for example, we probably need to add something on the

Ex. 5 - Deliberative

We will need to keep editing while you review, but can add those pieces next week.

We look forward to your comments, and we thank you for your review.

best
Jen

Jennifer C. Jenkins, Ph.D.
Climate Policy Branch
Climate Change Division, Office of Atmospheric Programs
US Environmental Protection Agency
202-343-9361
jenkins.jennifer@epa.gov

From: Epanchin, Pete
To: Irving, Bill
CC: Jenkins, Jennifer; Ohrel, Sara; Sherry, Christopher
Sent: 5/13/2013 4:31:35 PM
Subject: Latest version of main body text for Bill's review.
Attachments: AF2 main body_5 8 2013_sk5-9_CS_pe.docx

Here you go, Bill.

Pete Epanchin, Ph.D.
AAAS Science & Technology Policy Fellow
US Environmental Protection Agency
Office of Air & Radiation
Office of Atmospheric Programs
Climate Change Division
Climate Policy Branch
202-343-9598

From: Jenkins, Jennifer
To: Kocchi, Suzanne; Ohrel, Sara; Irving, Bill
Sent: 5/13/2013 3:28:03 PM
Subject: RE: feedstock list for sarah - quick turn
Attachments: Biogenic Feedstocks List for Sarah_clean.DOCX; Biogenic Feedstocks List for Sarah_SO jcy.DOCX

Looks good -- here are a few edits, in both tracked and clean versions.

I wasn't sure if you meant for me to send to Paul, or if you wanted to forward... Either way is fine.

Thanks!
Jen

From: Kocchi, Suzanne
Sent: Monday, May 13, 2013 1:39 PM
To: Ohrel, Sara; Jenkins, Jennifer; Irving, Bill
Subject: RE: feedstock list for sarah - quick turn

Thanks -- Jen please make whatever edits you need and then send 2 versions a clean one with all comments removed that Paul can send to Sarah and then if you want to make sure we see the edits you can send a track change version one as well. Thanks!

From: Ohrel, Sara
Sent: Monday, May 13, 2013 1:36 PM
To: Kocchi, Suzanne; Jenkins, Jennifer; Irving, Bill
Subject: RE: feedstock list for sarah - quick turn

Hi all,
My thoughts as well as Bill's edits.
Sara

From: Kocchi, Suzanne
Sent: Monday, May 13, 2013 1:34 PM
To: Jenkins, Jennifer; Irving, Bill; Ohrel, Sara
Subject: RE: feedstock list for sarah - quick turn

Sara -- can you add in Bill's edits to yours? Thanks.

From: Jenkins, Jennifer
Sent: Monday, May 13, 2013 1:30 PM
To: Irving, Bill; Ohrel, Sara; Kocchi, Suzanne
Subject: Re: feedstock list for sarah - quick turn

I can review at 3

From: Irving, Bill
Sent: Monday, May 13, 2013 1:14:43 PM

To: Ohrel, Sara; Kocchi, Suzanne; Jenkins, Jennifer
Subject: RE: feedstock list for sarah - quick turn

Some minor comments

Ex. 5 - Deliberative

From: Ohrel, Sara
Sent: Monday, May 13, 2013 12:04 PM
To: Kocchi, Suzanne; Jenkins, Jennifer
Cc: Irving, Bill
Subject: RE: feedstock list for sarah - quick turn

Thanks. I can take a crack at 1pm unless Jen or Bill can look before then.

From: Kocchi, Suzanne
Sent: Monday, May 13, 2013 12:02 PM
To: Jenkins, Jennifer; Ohrel, Sara
Cc: Irving, Bill
Subject: feedstock list for sarah - quick turn
Importance: High

Sarah is scheduled to conversation with Gina, Steve and Goffman on Wed about biomass. She asked Paul on Fri for some more information on

Ex. 5 - Deliberative

 I started a quick table, taking the list of feedstocks from the report and some high level points. Please take a quick look and make whatever edits are needed or additional points at a high level (a Gina level and a level that Sarah will understand but not lead to complicated explanation/more questions). You will note I

Ex. 5 - Deliberative

Ex. 5 - Deliberative

Ex. 5 - Deliberative

 Paul will want to give to Sarah today so hopefully this is doable. Thanks!

From: Irving, Bill
To: Jenkins, Jennifer; Ohrel, Sara; Sherry, Christopher; Epanchin, Pete
Sent: 5/5/2013 11:07:35 PM
Subject: Fw: AF2 Part IV comments
Attachments: AF2 main body with_comments_merged ICF BI_04-29-13_SO_vMOVE_BI_(cinco mayo).docx

Remaining comments on part 4. I didn't edit all of the certification text because I have some more general questions (embedded in doc).

Bill

From: William N. Irving
Sent: Sunday, May 05, 2013 11:00:11 PM
To: Irving, Bill
Subject: AF2 Part IV comments

From: Irving, Bill
To: Ohrel, Sara
CC: Jenkins, Jennifer; Sherry, Christopher; Epanchin, Pete
Sent: 5/1/2013 6:10:32 PM
Subject: RE: updated main doc draft
Attachments: AF2 main body with_comments_merged ICF BI_04-29-13_SO_vMOVE_BI_BI.docx

Here are comments up until Section 4.

From: Ohrel, Sara
Sent: Tuesday, April 30, 2013 3:44 PM
To: Irving, Bill
Cc: Jenkins, Jennifer; Sherry, Christopher; Epanchin, Pete
Subject: updated main doc draft

Hi Bill,
This version has all recent comments from you and others as received yesterday. I have not addressed them all, but this at least has them all. It also has ICF formatting and changes to flow.

Sara Bushey Ohrel
Climate Economics Branch
Climate Change Division
U.S. Environmental Protection Agency
Phone: (202) 343-9712
Cell: (202) 341-6748

From: Irving, Bill
To: Kocchi, Suzanne
Sent: 4/24/2013 8:34:24 AM
Subject: FW: Revised Part II Section 2
Attachments: AF2 main body 4 22 2013 with_comments (BI).docx

In case you want to start with my version.

From: Irving, Bill
Sent: Tuesday, April 23, 2013 11:14 PM
To: Jenkins, Jennifer; Sherry, Christopher; Ohrel, Sara; Epanchin, Pete
Subject: RE: Revised Part II Section 2

All - here are my edits & comments on Part II, Section 1. I hope to have comments on section 2 by the end of the day on Friday, but it will depend on how fast it goes.

Ex. 5 - Deliberative

will work. I have made quite a few edits and comments on some of the sections. For example, in places I've deleted text that is redundant or offers too much detail for a front section.

My main substantive general comment is:

Ex. 5 - Deliberative

Ex. 5 - Deliberative

Also, I'm going to check in with Paul on schedule, but my recommendation is that we do as much as we can to get the text ready prior to giving it to him for review. This approach may mean that we don't give it to him next week as set in the schedule.

Bill

From: Jenkins, Jennifer
Sent: Friday, April 19, 2013 5:00 PM
To: Sherry, Christopher; Ohrel, Sara; Epanchin, Pete
Cc: Irving, Bill
Subject: RE: Revised Part II Section 2

Thanks Chris!

Bill, this new version should replace the Section 2 text in the Part II version that I sent to you for review on Sunday. ICF is also working on pieces of Part II, so when we get that piece back (should be within the next couple of hours) I will send out an updated, complete draft of Part II, so that you can have it all in one place.

Jen

From: Sherry, Christopher
Sent: Friday, April 19, 2013 1:32 PM
To: Jenkins, Jennifer; Ohrel, Sara; Epanchin, Pete
Cc: Irving, Bill
Subject: Revised Part II Section 2

Team,

Here is the revised version of Part II Section 2, based on this morning's conversation about **Ex. 5 - Deliberative**. Note, in the redline version, you'll see some other changes, as I had the opportunity to review the previous draft that I had sent to Jen last week – so some other clean-up in the first half of the draft (nothing major). Didn't have a chance to do similar review of the second half.

Chris

Christopher Sherry
Climate Change Division, Climate Policy Branch
U.S. Environmental Protection Agency
Phone: 202-343-9530
Mobile: 202-340-3379
sherry.chris@epa.gov

From: Kocchi, Suzanne
To: Ohrel, Sara; Irving, Bill; Epanchin, Pete; Sherry, Christopher
Sent: 3/5/2013 4:39:35 PM
Subject: RE: question on black liquor

Lets see if we can do **Ex. 5 - Deliberative**

From: Ohrel, Sara
Sent: Tuesday, March 05, 2013 4:38 PM
To: Kocchi, Suzanne; Irving, Bill; Epanchin, Pete; Sherry, Christopher
Subject: FW: question on black liquor

FYI – per the questions on black liquor (slide 16). Other answers on **Ex. 5 - Deliberative**
black liquor forthcoming.

From: Baker, Justin [<mailto:justinbaker@rti.org>]
Sent: Tuesday, March 05, 2013 4:22 PM
To: Ohrel, Sara
Subject: FW: question on black liquor

See table below.

Justin S. Baker, Ph.D.
Senior Economist
Agricultural, Resource & Energy Economics and Policy Program
Global Climate Change and Environmental Sciences Unit
RTI International
3040 Cornwallis Road
P.O. Box 12194
Research Triangle Park, NC 27709-2194
Phone: (919) 541-6933 Fax: (919) 541-7155
Email: justinbaker@rti.org

From: Stevens, Ryan
Sent: Tuesday, March 05, 2013 4:21 PM
To: Baker, Justin
Subject: RE: question on black liquor

Ex. 5 - Deliberative

From: Baker, Justin
Sent: Tuesday, March 05, 2013 4:10 PM
To: Stevens, Ryan
Subject: FW: question on black liquor

Ryan—can we get a quick response to Sara on her third question **Ex. 5 - Deliberative** ?

Thanks,
J

From: Ohrel, Sara [<mailto:Ohrel.Sara@epa.gov>]
Sent: Tuesday, March 05, 2013 4:04 PM

To: Baker, Justin
Subject: question on black liquor

Hi Justin,

Ex. 5 - Deliberative

On the first two, if you don't know, could you please point me in the direction of a resource for that info?

Thanks!

Sara Bushey Ohrel
Climate Economics Branch
Climate Change Division
U.S. Environmental Protection Agency
Phone: (202) 343-9712
Cell: (202) 341-6748